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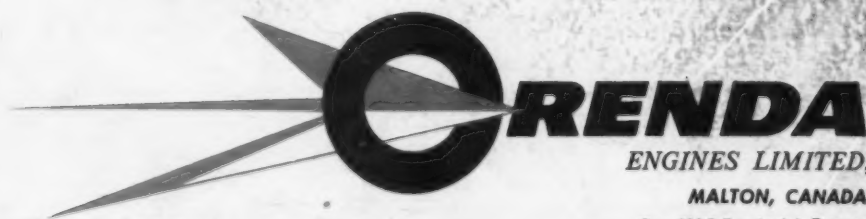
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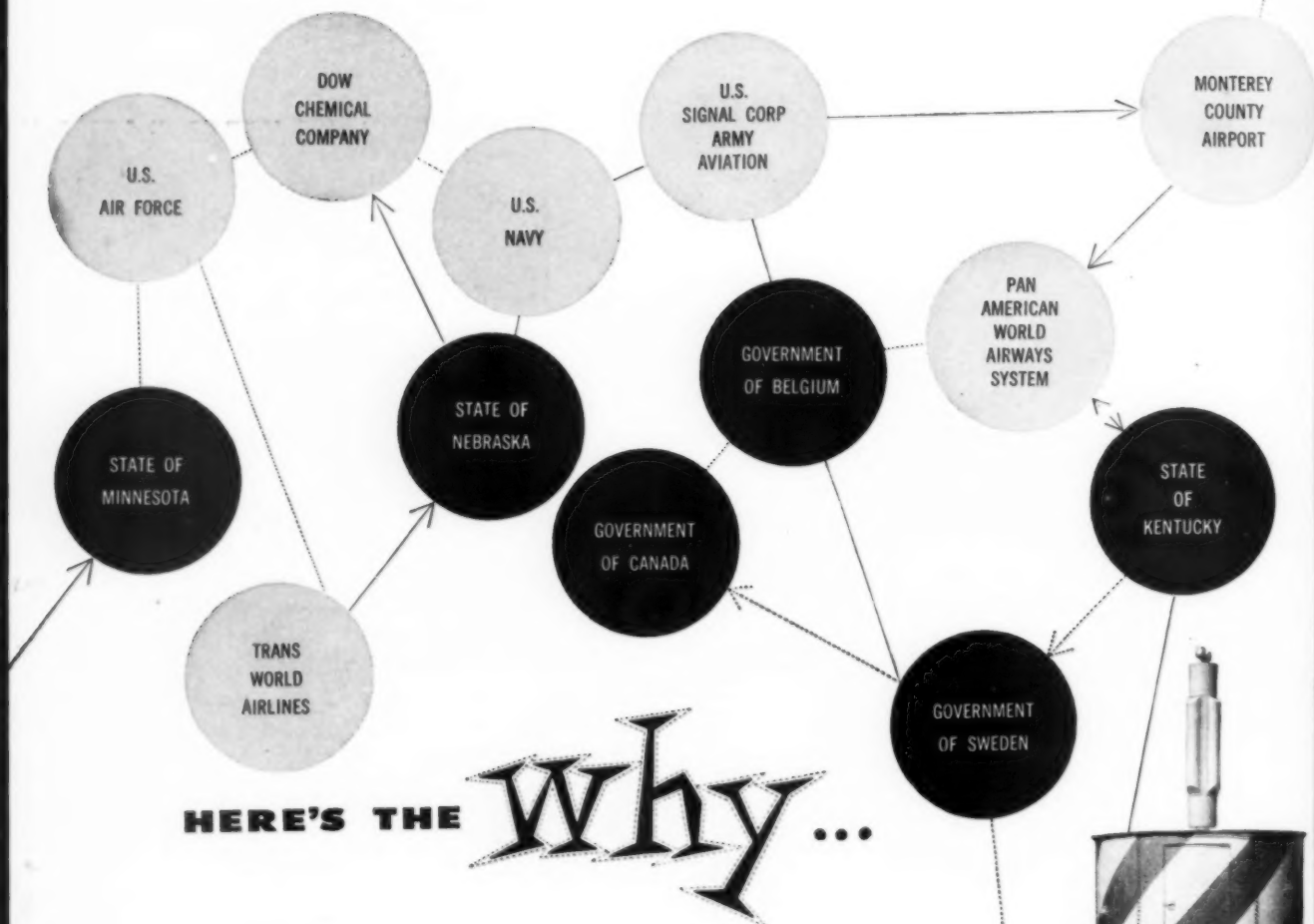
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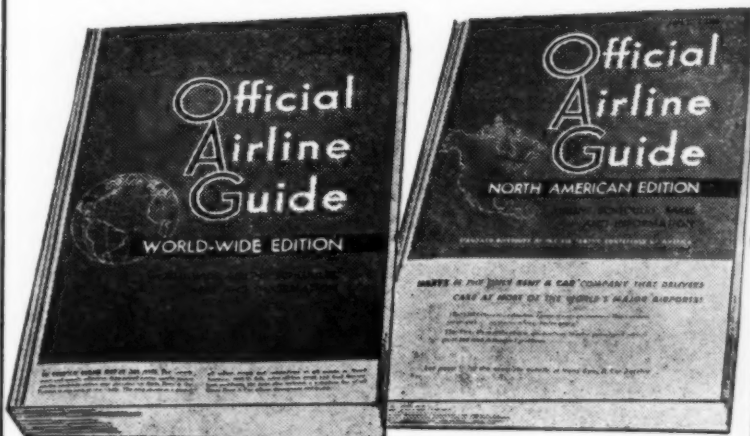
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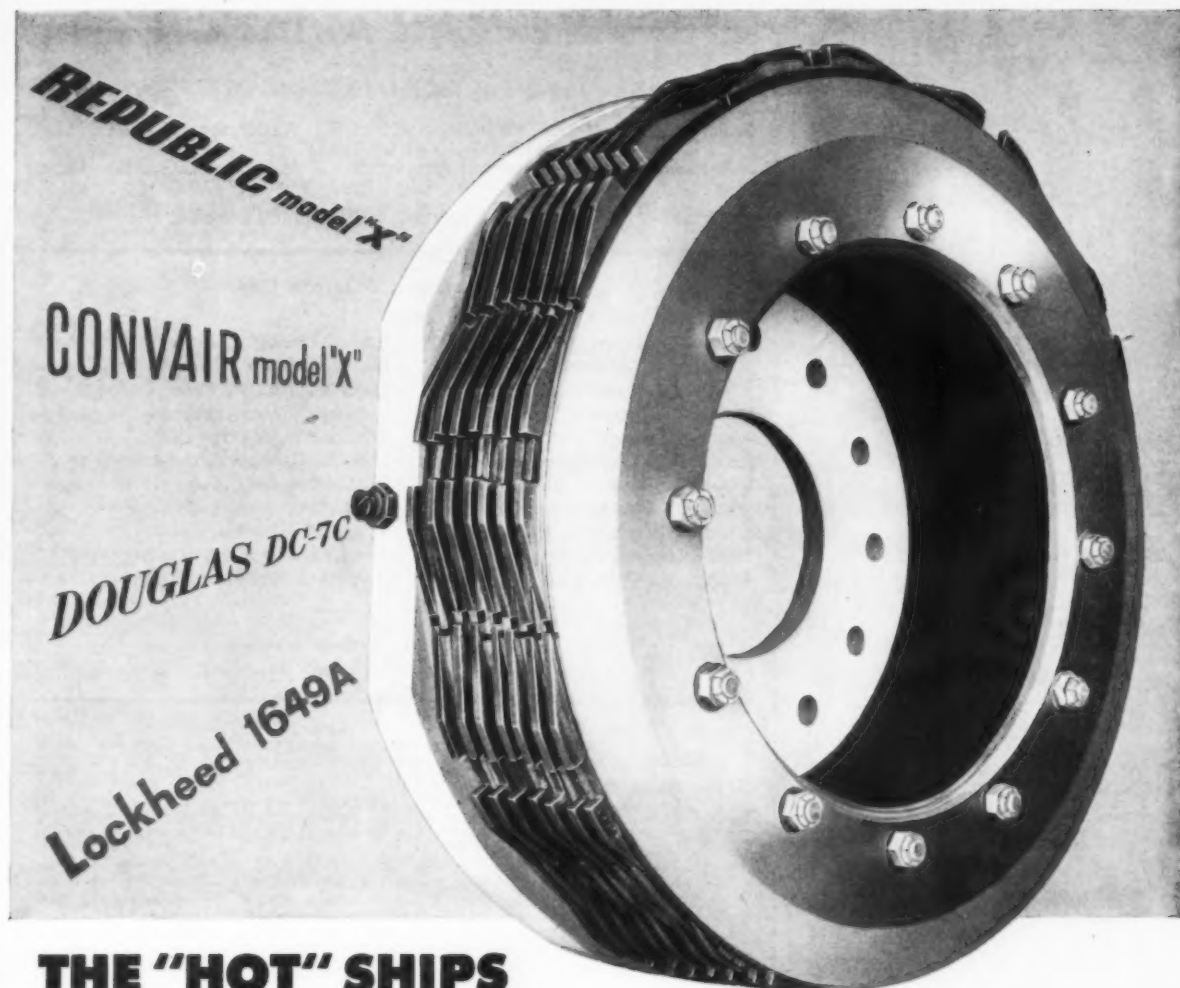


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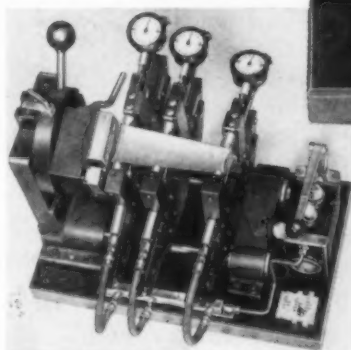
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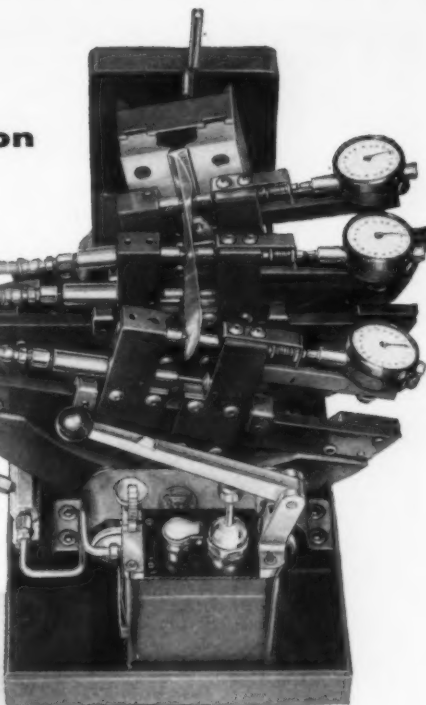
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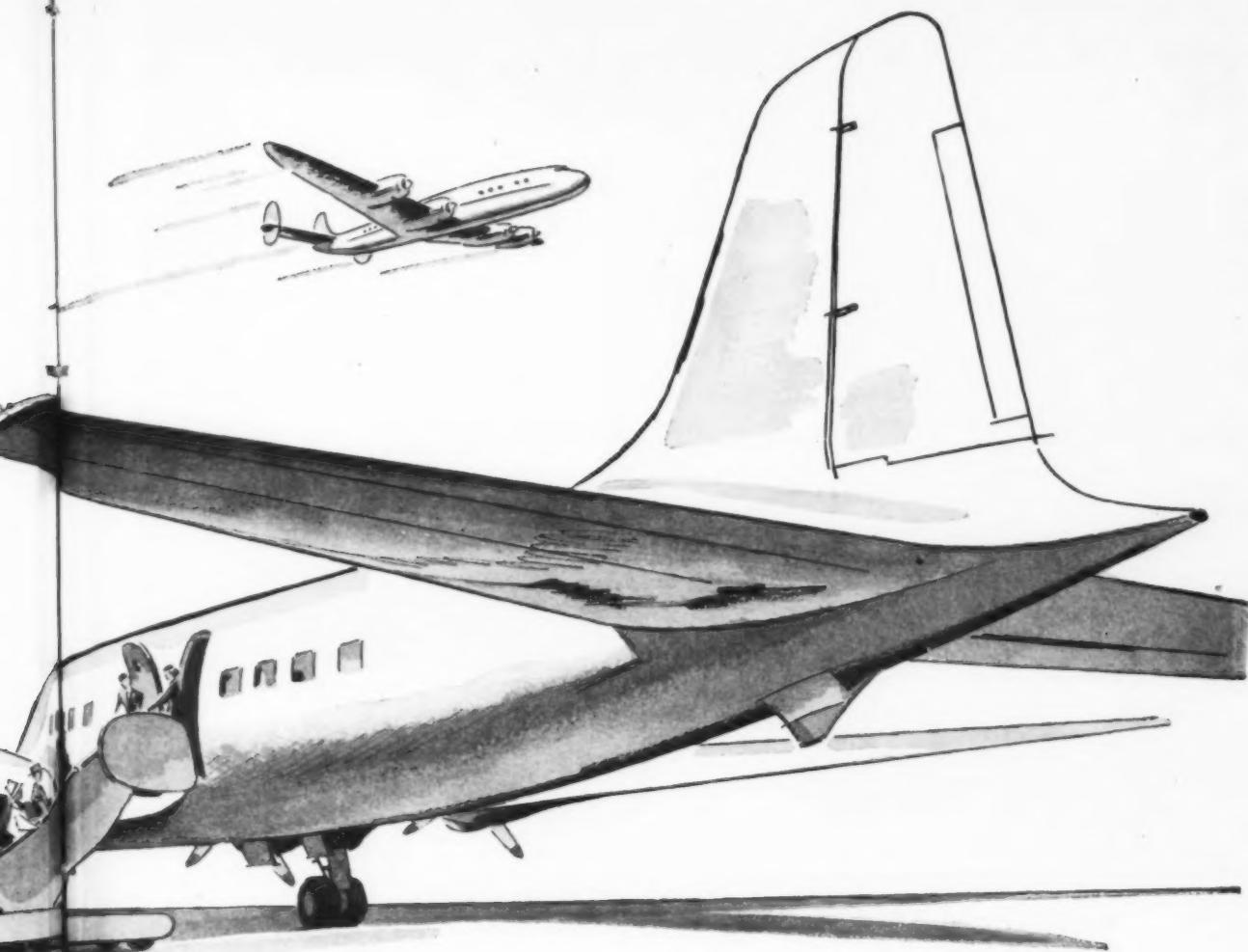
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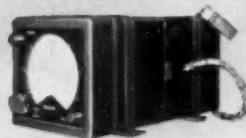
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AMERICAN AVIATION

CAA Is in the Spotlight Again

IT IS HARDLY NEWS that the CAA is undergoing another investigation in Congress because there have been few years out of the last twenty when civil aviation wasn't under one spotlight or another on Capitol Hill.

At the moment it is Senator A. S. Mike Monroney, the agile Oklahoma Democrat, who received the ball and started running like mad down the field. It was a perfect pass thrown by the Commerce Department on the firing of Fred Lee as CAA Administrator but after three days of hearings it became evident that the yardage gain was awfully small. Maybe the next play will be more profitable.

If pursued beyond the pat phrases and newspaper headlines, the issues are quite complex and real. It is just possible that Senator Monroney has found this out, but now that he has performed his headline chore for his party there is a question as to how serious he really is.

What the Senator is really after, so he says, is the re-creation of the CAA as an independent agency completely free of politics. He brushes aside the fact that it was a Democratic president, Mr. Roosevelt, who destroyed the independence in the first place back in 1940. One would think from all of the current screaming that it was the Republicans who did the hatchet job.

What civil aviation wants is a well-administered dynamic program and there are ample grounds for believing that it hasn't got one today. The airway navigation and airport problems are staggering. Much time

has already been lost in getting something constructive under way and it is perfectly true that the Eisenhower Administration has fumbled badly on civil aviation, both with CAA and CAB.

But we don't believe that an independent CAA is the answer. There was a time when this magazine shouted from the housetops for independence. But times have changed. Aviation today must have cabinet-level attention and representation. It isn't strong enough to merit or warrant a separate cabinet department, so it must be fitted in somewhere and Commerce is as convenient as any.

The trouble lies in the poor leadership within Commerce, not in the basic structure. The Weeks-Murray combination of two years ago was pretty awful. The Weeks-Rothschild combination is a vast improvement. But what is really needed is to make the CAA Administrator either an Assistant Secretary or Under-Secretary and provide the proper line of authority.

It would be difficult not to like Fred Lee. He is a man of fine character. But it has been obvious to all for some time that a more dynamic and assertive leadership in CAA has been needed. We think Charles Lowen, Lee's successor, has started out terrifically well and we wish the Senate would stop wasting time and confirm him so he can get on with his job. There is so much to be done—now. Meantime we suggest to Senator Monroney that his bill for independence is ten years too late and is as obsolete as CAA's airway aid program has been.

He Didn't Know When to Quit

THE PASSING of Ralph S. Damon at 58 on January 4 was a stunning blow for both TWA and the aviation industry. The official report said pneumonia but his friends knew that underlying the technical cause was overwork tinged with a frustration deriving from the working conditions inherent in the peculiarly monolithic ownership of the company. Even the most miraculous of the new miracle drugs cannot perform when resistance is at a low ebb.

Here was a great and a good man who had seemed to possess an inexhaustible drive. He didn't know what the word 'quit' meant. A man of genuine principles with a fierce devotion to his country, he had a lifetime of accomplishments far exceeding those of most successful men. Yet underneath it all he was unusually sensitive and self-critical—with the least reason for being so.

Ralph Damon was the kind of leader who believed in devoting energies beyond the call of immediate duty. He contributed generously of his time and efforts in a great many directions. He had the distinction of rising to the top in both aircraft manufacturing and airline management. Probably no one in aviation

knew more people, high and low, by their first names or nicknames, and no one, certainly, maintained a more voluminous correspondence with friends all around the world.

One of his truly great achievements was probably the most intangible and the least recognized. All along the band of air routes extending eastward from Los Angeles and San Francisco to Europe and beyond to Ceylon in faraway Asia, he inspired a personal devotion and following which transcended nationality, race, color and creed. As a living example of the best of progressive American industry, he was unmatched in this generation for the good which he performed in international relations. His program of interchanging employee visits between the U.S. and other countries was an outstanding achievement.

For reasons known only to himself, Ralph Damon in recent years sought his major outlet in an unrelenting drive, the end result of which was his passing at an early 58. His loss to U.S. aviation is quite apparent, but to a great many from California to Ceylon his loss is a very personal one.

Industry News Digest

100-Mi.-Radar is Heart of Idlewild's New ATC Center for New York Area

A new, modernized air traffic control center for the New York area was put into operation at New York International Airport, Idlewild, last week by the Civil Aeronautics Administration. Heart of the center will be a new 100-mile range radar unit manufactured by the General Electric Co. It will mark the first operational use of long-range radar for commercial operations.

The FPS-8 radar was developed for the Air Force under the direction of the Rome Air Development Center. It has been modified for the CAA center to meet the needs of air route traffic control. The equipment is manufactured by GE's Heavy Military Electronic Equipment Department in Syracuse.

Designed originally as a military long-range search radar, the GE unit is capable of controlling aircraft from the Center to over 100 miles in all weather conditions. It will work in conjunction with shorter-range radars located in the control towers at Newark, Idlewild, La Guardia airports and Mitchel AFB. It is capable of monitoring all traffic from Floyd Bennett NAS and Teterboro airport as well. Arrivals and departures at all six terminals can be accurately pinpointed under both Instrument Flight Rules and Visual Flight Rules conditions.

The aircraft can actually be seen on the scopes. Controllers are presented with a picture of all aircraft within a

radius of over 100 miles through radar scope presentations. Six of the 13 GE scopes are horizontal and present a magnified picture. This provides controllers with a means of marking by plastic tabs the identity and progress of each aircraft entering or leaving the New York metropolitan area.

The close surveillance is expected to virtually eliminate "stacking" and traffic delays. The FPS-8 radar permits only a five-mile longitudinal separation between aircraft after fix posting, thus increasing the acceptance rate of traffic at a New York airport to the physical limits of the airfield itself, rather than to the limitations of airways separation. It also eliminates the 10-minute longitudinal separation previously used on IFR departures.

Convair Has Orders For 67 Metropolitans

Orders for Convair 440 twin-engine Metropolitan transports now total 67, with sales of nine reported last week.

Newest purchasers: Braniff International Airways, five; Alitalia, Italian international airline, two, and Royal Australian Air Force, two in executive version.

First of the 440s, scheduled for delivery to Cities Service Oil Co., is undergoing flight tests for CAA certification and will be delivered this month.

Turbine 'Copter Crashes

World's largest turbine-powered transport helicopter, the Piasecki YH-16A, crashed Jan. 5 while on a test flight over New Jersey, killing the pilot and co-pilot.

Dead were Harold Peterson, chief experimental test pilot for Piasecki, and George Callahan, experimental test pilot.

Cause of the crash of the rotorcraft, which used two Allison YT38 turboprop engines, has not yet been determined.

Piasecki is installing two Allison T56 turboprops in the original XH-16 piston helicopter but first flight of that model, which will be the prototype of the YH-16B, is about a year away.

Navy Joins AF on A-Plane

Navy Bureau of Aeronautics and the Air Force are now jointly working toward development of an atomic-powered aircraft and any results involving a nuclear seaplane will prove highly valuable to the USAF, BuAer chief RAdm. James S. Russell has disclosed.

Russell said the two services may have numerous points of conflict, but that the nuclear plane is "definitely not one of them."

He traced early Navy participation in A-projects to its \$1.5-million funding of the Oak Ridge Nuclear Energy for Propulsion of Aircraft (NEPA) Project, but said this was dropped to concentrate on other fields after reaching an understanding with the AF.

Two New Orders Bring Viscount Sales to 274

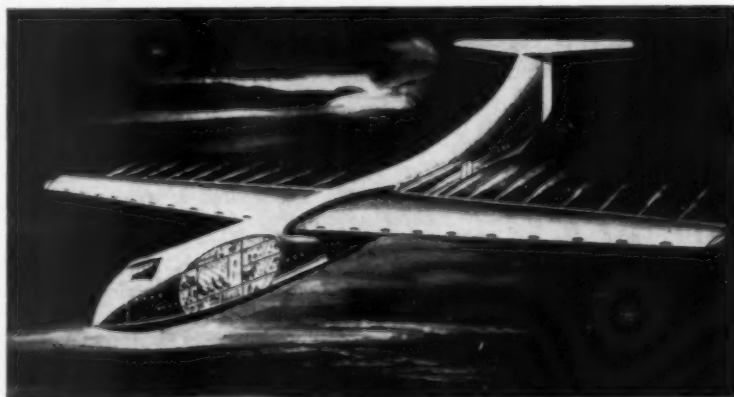
Vickers-Armstrongs' sales of Viscounts have now reached the 274 mark with the announcement of orders for four Viscount 803s for Air Austria and 16 more Viscount 800 series for British European Airways. The Austrian airline will get its aircraft in late 1957.

Boeing Gets \$258-Million Follow-on Order for B-52s

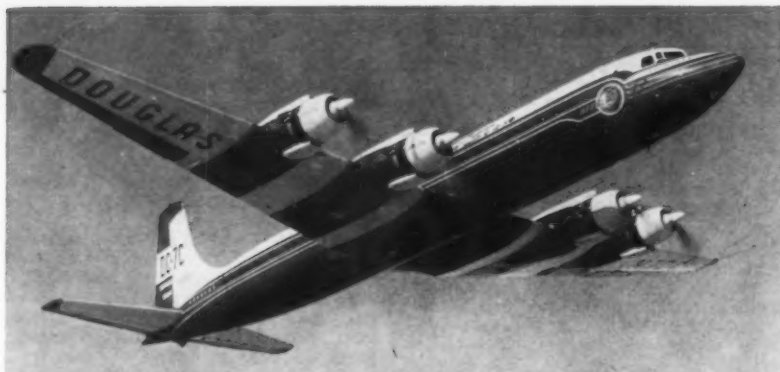
The Air Force gave Boeing Airplane Co. a \$248-million follow-on contract to build B-52 bombers at both its Seattle and Wichita, Kans., plants. The order was described as "probably the largest single order for the long-range bomber" since the B-52 program was started.

An AF spokesman said the latest B-52 contract conforms with production schedules previously laid down for the bomber and does not involve the purchase of any more planes than originally planned. The number of planes covered by the order was not disclosed.

Loening Envisions 1,500-Ton Cargo Flying Boat



This giant air cargo seaplane visualized by aviation consultant Grover Loening would gross over 3,000,000 lbs., measure 400 ft. long with a wing span of 430 ft. Powerplants, Loening says, would be twenty 22,500-lb.-thrust turbojet or nuclear-energy jet-driven types permitting cruise speeds as high as 600 mph and payload of 1,000,000 lbs. Based on a six-hour transatlantic flight, he estimates it would carry 150,000 tons of cargo a year or 50% more than present-day C-2 (18,000-ton) freight ships.



Douglas DC-7C, shown during first flight on December 20, is due for April delivery.

DC-7C 'Small' Compared To DC-8, Figures Show

Douglas Aircraft Co.'s DC-7C, largest and probably the last of its line of piston-engine airline transports, is still a relatively small aircraft by comparison with its upcoming jet, the DC-8.

The DC-7C, which first flew on December 20 and is due for delivery to airlines beginning in April, measures only about 8 ft. less than the DC-8 in wingspan but is a good 28 ft. shorter in fuselage length.

Exact dimensions of the two are:

	DC-7C	DC-8
Wingspan	127' 6"	134' 9"
Length	112' 3"	140' 6"
Height	31' 10"	42' 4"

To date some eleven airlines, including three U.S. and eight foreign carriers, have ordered 105 DC-7Cs for delivery extending into 1958. Orders include: Pan American (33), Northwest (8), Braniff (7), BOAC and KLM (10 each), SAS (14), Sabena (9), Swissair, Panair Do Brasil and CMA (4 each) and TAI (2).

Airlines Record .65 Fatality Rate in '55

U.S. scheduled airlines during 1955 carried more than 41 million passengers an estimated 24,471,242,000 passenger miles with a final safety score of 0.65 passenger fatalities per 100 million passenger miles, Air Transport Association reports.

Combining to produce the 0.65 figure was a domestic airline fatality rate of 0.78 per 100 million passenger miles and an international/territorial rate of 0.04. Comparative 1954 statistics show an overall rate of 0.08 fatalities, domestic rate of 0.10 and international/territorial, no fatalities.

At year-end, foreign and overseas airlines had operated nine months without fatality (last accident March 26, 1955); local carriers, 57 months; territorial airlines, 52 months, and helicopter services, 30 months.

Sharp rise in the 1955 accident rate over the previous year was primarily due to the seven fatal accidents experienced by the domestic trunk airlines. In flying 34.7 million passengers over 19.3 billion passenger miles, these carriers accounted for 156 of the total 158 passenger fatalities for the industry.

Not included in this total is the November 1 accident of a United Air Lines DC-6B involving 39 fatalities which was classed as "not due to operational difficulties, but to sabotage."

Army Has Long-Term Air Expansion Plans, Says Gen. Taylor

The U.S. Army may not have licked its problems with the Air Force as to just how big its aircraft can be, but that doesn't mean Army aviation won't continue to grow.

To the contrary, Army chief of staff Gen. Maxwell D. Taylor says the service will continue to expand its organic aviation in line with a long-term plan. But Taylor hedged when asked whether he will seek revision of the Memorandum of Understanding with USAF limiting Army aircraft to 5,000 pounds gross weight.

"Time marches on—technology increases. Every time we have had a mechanical limitation, eventually we have outgrown it," he said. When asked if this means the Army wants the 5,000-pound ceiling lifted, Taylor put it this way, "We want better airplanes than the ones we have."

The Army chief made these points on current aviation activity:

- Army is going all out to develop a 1,500-mile, medium-range ballistic missile with the aid of scientists who developed the Redstone. No one has started to worry about which service or services will use it.

- Army still represents "hitchhikers of our friends of the Air Force" in the field of strategic airlift. This doesn't mean it will seek strategic airlift capacity of its own, but it does plan to step up its cooperative efforts with the USAF. "First we must simplify and reduce the weight of our organic weapons, and second, we must rehearse in a token way" to test strategic air mobility, Taylor explained.

Boeing Produces 500th Gas Turbine Engine

Boeing Airplane Co. has turned out its 500th gas turbine engine, a Model 502-7 unit for the Air Force. Boeing estimates it has now produced about 150 of the small jets for AF use as powerplant for aircraft turbine engine pneumatic starter carts. It has also delivered more than 250 to the Navy, primarily for non-aviation applications.

First of BOAC's Bristol Britannias Delivered



British Overseas Airways Corp's first two Bristol Britannia 100 turboprop transports have been delivered. The airline will get 13 more 100s, seven 300s and eleven 310s (formerly designated 300LR).



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Letters

More Channel Wing

To the Editor:

My letter about channel wing aerophysics, which was published in your Nov. 21 issue, appears to have opened wounds in the vanity of several aerodynamic flight advocates. Since short letters can not provide adequate coverage for the complex science of aerophysics, I would like to vindicate several minor errors in description by labeling them as "poetic license."

In an aviation industry that generally confuses a static, molecular air-separation for a dynamic, mass air-movement (connoted by the term "air-speed"), a condensed presentation of new terms, such as "thrust dissipation" or "progressive absorption," would only add to confusion and heighten a controversy that needs settling.

... Aerophysics application of the channel wing is based upon relativity. The influence of restrictive aerodynamic thinking, however, has led to an atrophy in the minds of many persons who are not qualified to think in this dimension. Accordingly, the acceptance of channel wing by a completely alert industry may require quite some passage of time.

History verifies dimensional controversies in the sciences and indicates the battles required to overcome "plane" thinking in order to foist three-dimensional reality. For example, our well-established spherical world was thought a "plane" world by the consanguine "aerodynamicists" of Columbus' day. His contemporary, da Vinci, is only now being appreciated for his scientific worth.

Common man learned to walk in the two-dimensional plane after he was educated to recognize the related third dimension. He will learn to "fly" in three dimensions only when he can fully recognize and understand the fourth.

An excellent rule to consider in our present existence is "Never underestimate the intelligence of an adversary." I wish to reiterate that Russia is definitely investigating aerophysics applications of channel wing with an open mind that is aimed toward advancement of omni-directional flight.

We would do well to convert the "airPLANE" from its singular aerodynamic propulsion methods to a vehicle of dimensional utility, using vacuumatic-force induction. The American invention, Custer's Channel Wing, offers the mechanical substitute for true flight but its initial use by a nation will evolve only after quantitative production and qualitative appreciation is fostered by accomplished technicians.

DEL SANTEE
Aerophysics Consultant

Valdosta, Georgia

STOL Design

To the Editor:

My attention has been called to the article in the Dec. 5, 1955, issue of your magazine titled "Fairchild Takes Wraps off STOL design" (p.28). Aside from the fact that the release is, unfortunately, quite premature, in general, I believe the impression one gains from reading the article is that the design, its concept and the slip stream

principles involved are all Fairchild Aircraft Division-sponsored innovations. I would like, if I may, to rectify this situation.

The so-designated "Fairchild Model M-232" is, in fact, the Hunt "Dragonfly" type aircraft Model HD-7 which is entirely my own concept, originally as the HD-6 and then HD-7 (4-22-53) which incorporates the patented Hunt Power-Lift Principle (U.S. Pat. 2,650,045).

In 1953, a private venture engineering and construction program was entered into between the Fairchild Engine & Airplane Corp. and the Wiggins-Hunt Engineering Corp., together with Albert E. Blomquist & Assoc., Ringoes, N. J., to design and build the Model HD-7 "Dragonfly" in Norwood, Mass., on the premises of Wiggins Airways Inc. In addition, a licensing agreement exists between Fairchild Corp. and Wiggins-Hunt Engr. Corp. for the use of the Hunt Power-Lift Principle.

Except for final assembly, the complete HD-7 project has been carried on at Norwood, completely divorced from the Fairchild Aircraft Division up until September of this year, at which time the project was moved to Hagerstown for testing and final assembly.

It might be of interest to you to know that the present HD-7 "Dragonfly" stems directly from the original Mk. I "Dragonfly," with which I was also connected during 1932-37. The original Bolas Patent No. 1,933,307 was assigned to me in 1949 prior to its running out in 1950, at which time my application went in. The patent was issued to me in 1953.

WILLIAM E. HUNT
Vice President
Wiggins-Hunt Engr. Corp.

Norwood, Mass.

Nonsked Decision

To the Editor:

I wish to congratulate you on the comments on pages 11 and 80 of the issue of December 5, 1955, of AMERICAN AVIATION in regard to the two recent decisions of the Civil Aeronautics Board in connection with the large irregular air carrier investigation.

I have been studying air law and working some with it since the bills were introduced that became the Air Commerce Act of 1926 and the recent decisions of the Board are anything but convincing. I think the dissenting opinions of Members Gurney and Denny are thoroughly sound. I have been waiting for somebody like you to make the comments you made on the pages I mentioned.

ALBERT E. REITZEL
Attorney and Counselor at Law
Washington, D. C.

Engineering Issue

Oct. 25, 1955

To the Editor:

Your article in the Oct. 24 issue (Electronics Reaches into Future to find Substitutes for Human Senses) was a good one. I particularly enjoyed the first section which dealt with your findings and feelings about man's function in modern high performance aircraft.

CARL S. TINCH
Aviation Technical Editor
Advertising Dept.
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Production Spotlight

• "Goddard" has been proposed as the name for the first U.S. satellite, in memory of the late American rocket pioneer, Robert H. Goddard.

• Northrop salesmen are trying to interest the West German Air Force in a new light-weight delta-wing fighter design.

• U.S. titanium producers have been told by the government in secret briefing sessions that the Russians are designing "sizable quantities" of titanium into their advanced military aircraft.

• The Boeing 707 intercontinental version is likely to gross well over 300,000 lbs. by the time it enters service.

• Republic Aviation Corp. may soon take an option on the Sncase Caravelle license. The French jet transport recently made its 100th flight. It has logged 213 hours since it first flew last spring.

• Handley Page Herald "DC-3 replacement" has completed the first phase of its flight test program. It has been returned to the Reading (England) plant, where it was built, for overhaul and modification.

• USAF's Boeing Bomarc interceptor missile should be ordered into mass production soon. Boeing has let a subcontract to Kaiser Metal Products, Inc., for 10 IM-99 shells—in effect an effort to see whether subcontractors can produce to its specifications for the supersonic missile. Production will be at Boeing-Wichita.

• Attainment of a true intercontinental ballistic missile is now officially expected "within six to 10 years at the most but possibly much sooner." Pentagon planners don't really care whether it proves to be the Convair Atlas, Martin's WS-107 or an outgrowth of the Army's Redstone as long as it is available before the Russians have their ICBM.

• Prototype nuclear aircraft engine, built by General Electric at Evendale, Ohio, is ready for ground tests at the Atomic Energy Commission reactor test station in Arco, Idaho.

• First of 95 Fokker S-11 primary trainers has been completed by Fokker Industria Aeronautica, the Dutch company's Brazilian associate. Brazilian production of the Fokker S-14 jet trainer is also planned.

• Ramjets and rocket motors are being built in Sweden by Svenska Flygmotor. The company recently tested its first Rolls-Royce Avon RA 7 which it will produce under license.

• De Havilland can deliver the 14-seat Heron four-engine transport in about eight months after receipt of the order. Price is \$142,800 without radio.

• Snc du Sud-Est now has orders for 180 SE 3130 Alouette helicopters from French military and commercial customers.

• Overhaul life of the de Havilland Hydromatic propellers flying on British European Airways' Viscounts has been increased from 1,250 to 1,500 hours.

• Initial bench tests of the Napier Gazelle have been completed. The engine is a shaft-drive version of the Oryx gas generator.

• De Havilland has sold 100 Heron four-engine transports to date and has delivered all but 11; 75 are in use on scheduled airline services, ten are private or executive aircraft and five are on military communications duties.

• First North American Aviation radar-equipped F-100D interceptor, which also has aerial refueling capability similar to earlier versions of the F-100 series, has been delivered to the Air Force.

• Douglas Aircraft still expects additional orders for the DC-6/7 series although production now is scheduled well into 1958 and the first DC-8 jet transport is due a year later.



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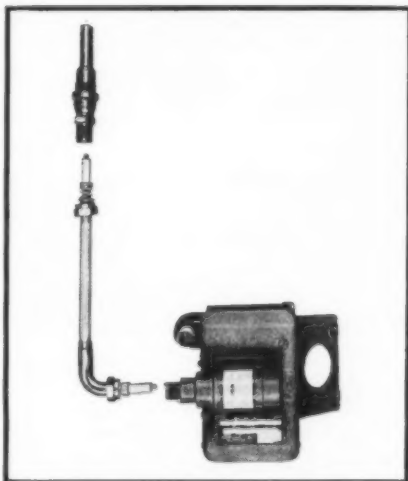
- Jan. 19-21—National Simulation Conference sponsored by Dallas-Fort Worth Chapter of Institute of Radio Engineers Group on Electronic Computers, Baker Hotel and Republic National Bank Bldg., Dallas, Texas.
- Jan. 23-25—Helicopter Association of America, annual convention, San Francisco.
- Jan. 23-26—Plant Maintenance and Engineering Conference and Show, Convention Hall, Philadelphia.
- Jan. 23-26—Institute of Aeronautical Sciences 24th annual meeting and Honors Night Dinner, Sheraton-Astor Hotel, New York.
- Jan. 26—Airwork-AC Spark Plug Clinic, L. B. Smith Aircraft Corp., Miami.
- Jan. 30—AC Spark Plug Clinic, Airwork-Southern Airways, Atlanta.
- Jan. 30-31—Industrial Economics Conference sponsored by Stanford Research Institute, Statler Hotel, Los Angeles.
- Feb. 2-3—National Symposium on Microwave Techniques, sponsored by Institute of Radio Engineers, Philadelphia.
- Feb. 2-3—Vickers, Inc., first jet engine hydraulic symposium, Park Shelton Hotel, Detroit.
- Feb. 7-9—Eleventh annual conference Reinforced Plastics division of Society of Plastics Industry, Hotel Chalfonte, Atlantic City.
- Feb. 9-11—Eighth Annual Southwestern IRE Conference and Electronics Show, Municipal Auditorium, Oklahoma City.
- Feb. 16-17—IRE-AIEE-University of Pennsylvania Conference on Transistor Circuits, Philadelphia.
- Feb. 21-23—Air Transport Association reservation committee, St. Charles Hotel, New Orleans.
- Mar. 14-16—Annual Aviation Division Conference, American Society of Mechanical Engineers, Los Angeles.
- Mar. 14-16—American Society of Mechanical Engineers, aviation division conference, Hotel Statler, Los Angeles.
- Mar. 19-21—Society of Automotive Engineers, National Production meeting and forum, Hotel Statler, Cleveland.
- Mar. 19-22—Institute of Radio Engineers National Convention and Radio Engineering Show, New York.
- April 9-12—Society of Automotive Engineers, National aeronautic meeting, aeronautic production forum and aircraft engineering display, Hotel Statler, New York.
- Apr. 22-26—Twenty-ninth convention American Association of Airport Executives, Hotel Carter, Cleveland.
- Apr. 23-24—New England Radio Engineering Meeting, Sheraton Plaza Hotel, Boston.
- May 1-3—Electronic Components Symposium, sponsored by IRE, AIEE, RETMA, WCEMA, NBS, Departments of Defense and Commerce, Department of Interior Auditorium, Washington, D. C.
- May 2—Fourteenth annual conference Society of Aeronautical Weight Engineers, Ft. Worth.
- May 6-9—Second National Flight Test Instrumentation Symposium, Ft. Worth, Tex.
- May 14-15—National Aeronautical and Navigational Conference, Hotel Biltmore, Dayton, Ohio.
- May 24-26—Tenth annual convention of Armed Forces Communications and Electronics Association, Statler Hotel, Boston.
- May 27-June 3—Annual Convention, Aviation Writers Association, San Francisco.
- June 3-8—Summer meeting Society of Automotive Engineers, Hotel Chalfonte, Atlantic City.
- June 17-21—Semiannual meeting American Society of Mechanical Engineers, Hotel Statler, Cleveland.
- June 19—Tenth session of International Civil Aviation Organization Assembly, Caracas, Venezuela.
- June 20-22—Twenty-seventh meeting Aviation Distributors and Manufacturers Association, Grove Park Inn, Asheville, N. C.



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REQUEST BY TOP ARMY ECHELONS for a revision of the 1952 "Memorandum of Understanding" with the Air Force is expected in March. Certain to come up for discussion are proposals to increase the 5,000-pound weight limit on Army planes, operation of "Sky Cavalry" for reconnaissance purposes, more battlefield-area airlift under Army control and possibly Army control of the AF's troop carrier wings.

Newest development in the continuing Army-AF feud is AF objection to the Army training 900 helicopter pilots at civilian primary training schools. Army is soliciting bids for schools located within 500 miles of Fort Rucker, Ala., but the AF feels this training should be its responsibility. If the AF succeeds in controlling primary helicopter pilot training, civilian schools would probably still be used. Problem may be thrown to Defense Secretary Wilson for decision.

ORAL ORDER TELLING THE SERVICES not to discuss new equipment (including aircraft) until it has been in operational service for one year has been rescinded. Release of information on new equipment is now back where it was before the order.

Vocal directive apparently stemmed from expanded interpretation of a memorandum prepared by AF Vice Chief, Gen. Thomas D. White, and Air Secretary Donald A. Quarles. White proposed that no new airplane be permitted to try an official speed run until that model had been in tactical use for a year. Quarles agreed, provided that the policy be applied to all critical performance data of new aircraft.

THERE'S A NEW LOOK to Pentagon's reserve tool program (as forecast in *AMERICAN AVIATION*, Jan. 2, p. 23). Revised machine tool and equipment mobilization policies ordered by Office of Defense Mobilization, and soon to be confirmed by Pentagon directives, are designed to head off the threat of obsolescence to such equipment by introducing more flexibility.

Main feature of revised program is decentralization. Individual services, not Defense Department, will be responsible for buying reserve tools as well as for handling appropriations requests of Congress. Unlike previous plan, tools procured for mobilization reserve will be available for current production use if needed.

Aside from Army, Navy and Air Force activities, a new "emergency production" tool program will be created under Defense Secretary Wilson. Funds will come from a \$100 million balance originally appropriated for the Reserve Tool Program that was suspended in November, assuming Congress agrees to amend appropriation language for this purpose.

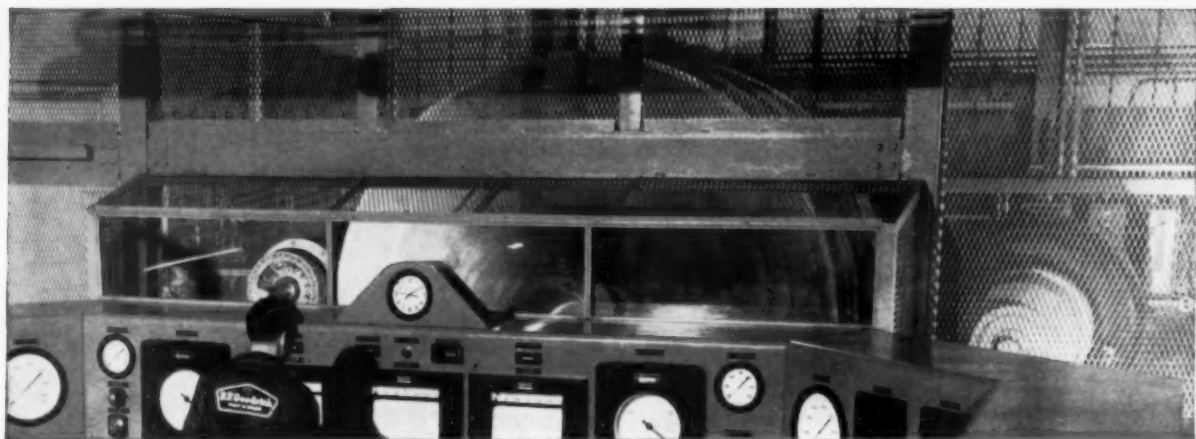
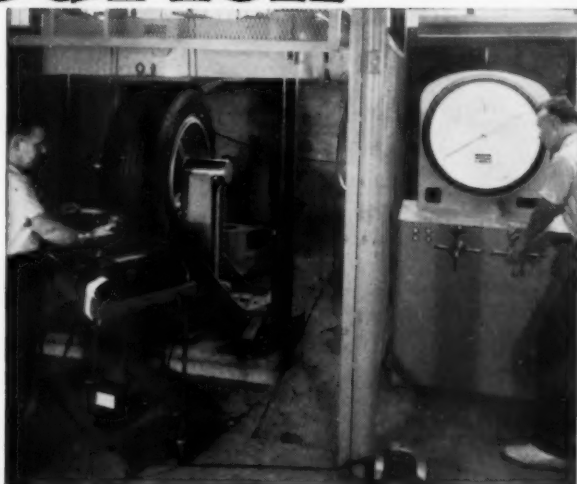
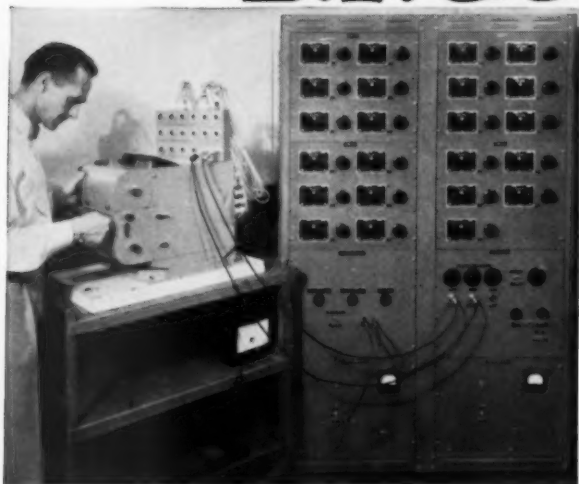
Altogether, some \$200 million was available for reserve tool purchases when the program was suspended. Half of this amount had been allocated to services, and the Army and Navy had already obligated their shares totaling \$16 million. The \$84 million earmarked for the USAF will be returned to the Treasury as unobligated funds.



ORDNANCE EXTRAORDINARY! The Terrier, the Navy's new all-weather anti-aircraft missile, is now being produced in quantity by Convair in the Naval Industrial Reserve Ordnance Plant of the U.S. Navy's Bureau of Ordnance. Responsible for supplying our Navy with the most effective weapons, the Bureau of Ordnance participates in vast programs of research, development, testing, and procurement. The Bureau of Ordnance facility at Pomona, California, managed and operated by Convair, is an outstanding example of government and industry working together to produce weapons systems for the defense of our country.

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How to land a bomber in a phone booth

BEFORE B. F. Goodrich engineers devised and built the computer in the upper left hand picture, testing a new brake design was a time-consuming process. Laboratory tests of the finished product—sometimes even actual flight tests—had to be made before basic design specifications could be confirmed or modified. But now BFG design engineers have a short-cut. An electronic analog, almost small enough to fit in a telephone booth, simulates a landing and gives preliminary data—in minutes! BFG engineers correct and refine brake design data in the earliest stages, avoid "blind alley" tests that could waste weeks or months.

How do you benefit? We give you faster delivery by speeding up qualification of our brakes. We give you better

braking assemblies because we can quickly confirm new engineering and design ideas. And you further benefit by actual dynamometer tests which verify the analog's electronic fortune telling.

At top right you see a BFG forged magnesium wheel passing a terrific static overload test. Strains applied by the 500,000 lb. loading machines are being measured by resistance strain gages and recorded on the oscillograph.

Even more dynamic is the "refused take-off" test on the 250 mph dynamometer. A bomber's single wheel and dual brake combination must absorb more than 30,000,000 ft.-lbs. of kinetic energy—as much force as is generated by stopping approximately 65 automobiles going 60 mph—but the BFG brakes bring the plane

to a standstill in the specified landing time which assures a safe stopping distance. The wheel is undamaged.

The application of BFG knowledge and experience in research, testing, and quality control, assure you of getting the finest wheels and brakes. *The B. F. Goodrich Company, Tire and Equipment Div., Aeronautical Sales, Akron, Ohio.*

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Lee Firing: A Rare Election-Year Gem

Monroney Makes Political Hay at Hearing

Democrat charges 'ground-minded' Commerce officials usurped Presidential powers during Eisenhower's absence.

By FRANCIS J. KEENAN

The broad outline of a pattern was emerging after the opening days of hearings by Sen. Mike Monroney's Aviation subcommittee into the dismissal of Fred B. Lee as Administrator of Civil Aeronautics.

It was apparent that these were the main lines Monroney was laying down:

- That, in the President's absence, his subordinates were improperly "assuming Presidential powers."

- That the present Administration was committed to an out-dated, surface-minded transportation policy.

- That, with CAA under the policy control of the Commerce Department, its aviation responsibilities were sacrificed to other interests.

- That Fred Lee, who opposed Commerce Department restrictions on aviation activities was a sacrificial goat.

- That Congress, which set aviation policies and approved Lee's nomination, has an obligation to investigate.

For Monroney, the Lee affair seemed to be a rare political gem: a unique opportunity to combine real political advantage (and in a Presidential election year) with valid and effective work in the best interests of aviation. While by no means all observers agreed with the Oklahoma Democrat, none had yet spoken out against him. Only Transportation Undersecretary Louis Rothschild and subcommittee member Sen. Fred Payne (R-Maine) had demurred—Rothschild, in a press release, to justify his action on grounds of "harmonious working relations," and Payne, during the second day of hearings, to challenge the subcommittee's right to question the firing of an executive official.

- At this stage of the inquiry, Monroney based his case on the contention that, while the President can remove his appointed officials, his powers are not "those to be casually assumed" by his subordinates. To do

otherwise, he has pointed out, would create "chaotic conditions" with sub-officials improperly attempting to seize power.

To date, Monroney's direction of the investigation has been skillful. Not one to display all his cards at once, he led Lee, the first witness, step-by-step through the chronological details of his experience with Weeks, Rothschild, Adams and the President.

At each point, Monroney drew out every implication that Lee's testimony will bear. He frequently pointed up how Lee's experience with "politically-motivated" officials in the Commerce Department had hurt aviation, and justifies the legislation he has proposed to re-establish the independence of CAA.

- Logically, the Monroney inquiry would have to probe deep into the underlying factors which have brought the present crisis in civil aviation. However, the senator did not indicate im-

A Pair of Supersonic Interceptors



McDonnell Aircraft's F-101A Voodoo reportedly has exceeded 1,000 mph in level flight. F-101A is powered by a pair of Pratt & Whitney J57 turbojets. Two of the Air Force long range interceptors are shown during recent test. Planes are in production at St. Louis.

Dutch Jet Trainer Visits U.S.



Fokker S-14 side-by-side jet trainer is in U.S. for flight demonstrations before the military services. The 450-mph S-14 is powered by a Rolls-Royce Derwent, but later S-14-2 has Rolls-Royce Nene. Fairchild Aircraft holds license for production in U.S.

mediately whether he would pursue the essentially superficial Lee affair into the depths of such issues as: civil-military conflicts over traffic control and navigational aids, expensive airline needs vs. limited resources of private fliers, and the long-range financing of vastly-expanding aviation facilities.

He has strongly hinted, on the other hand, however, that a major target may be the nation's railroads and their alleged influence over Commerce Department and other Administration officials.

Monroney knows that railroad spokesmen long have objected to Federal funds spent on airports and airways as "favoritism" shown to a competing transportation agency. And he has charged, while leaving the charge undeveloped so far, that the Administration deleted a portion of the report of the President's Advisory Committee on Transport Policy (the Weeks Report) which, he alleges, treated aviation with particular harshness.

In summary, this is the story Lee told:

On October 17, Rothschild bluntly demanded his resignation, because "he didn't think we were getting along, and wouldn't get along, and had come to a parting of the ways."

In retrospect, Lee dates his difficulties with Rothschild to the appearance last May of a new, unwanted, unknown, Deputy Administrator (now Acting Administrator Charles Lowen) via a telephone call from Rothschild. Lowen then went to work on projects assigned largely by the Undersecretary, Lee says.

This occurred on the eve of Lee's departure for the hospital. While there, Rothschild told a Senate Appropriations subcommittee he was having

trouble getting material from CAA during Lee's absence. Lee denies this could have been so.

Both Lee and Rothschild testified before the Monroney subcommittee on the quarter-billion-dollar Airport Aid Bill. Rothschild opposed it; Lee, in response to subcommittee questioning, reported CAA's air traffic forecast and estimate of airport requirements. Afterwards, Rothschild accused Lee of testifying "too favorably."

•Monroney since has praised Lee's survey as "largely responsible" for

unanimous committee approval of his four-year aid program.

Lee says Rothschild also complained that CAA's long-range "radar cover" program was not cleared sufficiently along the way with Commerce officials before it went to ACC.

He also incurred "topside displeasure" for opposing recommendations of a Commerce-sponsored management study urging elimination of 300 communications stations and proposing a "three-dimensional concept" of airways control.

Neither Weeks nor Rothschild ever gave him any reasons or complaints justifying their attitude, Lee claims. Because he consistently refused to resign except at White House request, he says Weeks eventually arranged a meeting with Presidential Assistant Sherman Adams on December 3.

•Adams was non-committal. After reviewing the dispute and his record at CAA, Lee says he was told simply that "it was up to me" whether to resign.

"As a demonstration of good faith," Lee prepared a letter of resignation for the President on December 8, but attached to it a longer letter explaining his side of the story in an effort to stay on at CAA. Two days later, the President tersely accepted the letter of resignation.

Lee doesn't know whether the President saw both letters. ▲ ▲ ▲

Facts Behind Lee's Dismissal

By JOSEPH S. MURPHY

As Congressional fury over the "firing" of Fred B. Lee as CAA Administrator assumes new and greater political implications day by day, the real reasons for his displacement—vital "weak spots" in CAA's operation—are becoming more obscure.

This is true despite the widely accepted fact that virtually no segment of aviation except perhaps the private flying interests, has been satisfied with CAA's administration.

The dissatisfaction extends into many quarters—the military services, other government committees in which CAA is represented, and many segments of industry. And it takes as many different shapes—failure to cope with the air traffic control problem, resistance to outside assistance in licking its problems, inadequate planning, and just plain inertia.

•But in virtually every instance, opposition to CAA's methods stems from its inability to handle the mounting ATC situation. Military concern in this area has reportedly become so critical

that some top Air Force officials have openly expressed doubt as to their ability to carry out their defense mission with the air traffic control problem as it now exists.

Despite offers by the military of assistance, whether through use of air defense radar or radar approach control facilities, CAA has tenaciously held to its apparent top-level policy of non-cooperation.

In one recent instance, despite agreement by the Air Navigation Development Board, Air Defense Command and airlines over implementation of a particular ADC radar, CAA did everything in its power to prevent its implementation after being directed to do so.

•The fact that CAA resistance was top-level policy is evident in the entire handling of the ADC radar program. CAA's own Technical Development and Evaluation Center at Indianapolis had approved radar integration at three locations, yet no action was forthcoming from the Administrator to implement the TDEC recommendation.

AMERICAN AVIATION

Another key area of military distaste for CAA lethargy has been the programming of joint civil-military use of 75 Air Force and Navy radar approach control installations. From the start of the program worked out with CAA, it had only to budget for the operation of the facilities and furnish personnel after the first year of operation. The military supplied the complete RAPCON installation.

Aside from full-scale operation of several units, there has been no action by CAA. In one of its regions in which personnel recommended implementation of all RAPCONS, CAA has seen fit to place but one into operation.

• **The extent of CAA's lack of co-operation** in the ADC radar integration program reportedly reached a stage recently that mass resignations were threatened in one government body saddled with the task of spearheading future ATC developments.

Apart from its apparent efforts to thwart immediate attempts to ease the ATC situation, the second big fault found with CAA's handling of the traffic control problem has been its organization. Before Lee's dismissal, complaints by the military services and industry of the low-level stature of air traffic control within CAA led to a Commerce-sponsored move to correct this situation by raising ATC to the level of a separate CAA program office.

It has generally been conceded that Lee fought such a move vigorously, and that his opposition in this area was one of the big reasons for his replacement.

And pressures for a change in CAA attitude on ATC have by no means been confined to the military. Throughout the controversial DME/TACAN hassle last year, the Air Transport Association, representing the scheduled airlines, repeatedly charged CAA with misdirecting its efforts on the DME program at the expense of more vitally-needed ATC improvements.

• **Most frequently cited** of these were the expanded use of long-range radar, additional peripheral communications and better display techniques for air traffic controllers.

Feeling has been that all of these deficiencies are directly tied to a negative philosophy in CAA that air traffic control can only be as good as the black boxes developed, procured and installed by engineers of the Office of Federal Airways.

As a relatively insignificant part of this organization, the agency's air traffic control specialists in the past had to make the best of these developments, with little voice at top levels as to what equipment must be developed to do the ATC job.

• **Plan favored by industry and proposed by Commerce** will completely reverse this thinking. A new Office of Air Traffic Control, now in the planning stage, will give CAA an ATC activity reporting directly to the Administrator with full say on the equipment

it needs to carry out its assignment.

And with a corps of ATC specialists centralized in such an activity, headed by a competent director who is familiar with the ATC problem, it's a good bet that the discontent bred by CAA inertia in the past will be erased.

Flexibility for Emergency Production

AF Tailors M-Day Plans to Fit Nuclear or Localized Wars

The Air Force last month scored a major advance in the art of mobilization planning when it announced its comprehensive industrial readiness program. It was the first military production plan to be tailored for both all-out nuclear war and localized wars of long duration.

The AF program embodied these advantages:

• **A practical scheme** for jacking up production of super-priority strategic and defense weapons in the first weeks following a nuclear attack on the U.S.

• **A low-cost procedure** for accelerating production of tactical and supporting weapons systems over a period several months after the outbreak of a Korean-type conflict not affecting the continental U.S.

• **A sensible division** of aircraft and missile systems between the two basic mobilization procedures, depending upon which type of war they are designed to fight.

• **Subordination** of the over-all readiness plan to current procurement, avoiding the danger of mobilization

considerations dominating current production needs.

The AF program was outlined by Secretary Quarles in a memorandum to Gen. Nathan F. Twining, Chief of Staff. Its formal title: "Air Force Industrial Production Readiness Policy."

• **At the heart** of the new program are the twin concepts of "Production Compression" and "Production Acceleration." The former technique will be applied to strategic bombers, interceptors and missiles needed to conduct a general nuclear war, while the latter scheme is reserved for fighter-bombers, troop carriers, tactical missiles and other supporting systems required for a long-term peripheral war.

"Production Compression" is aimed at scraping up as much strategic and air defense equipment as possible in the first 60 to 90 days of an all-out nuclear war. It would go into effect the instant of attack at plants assembling the selected high-priority items.

Weapons still on the assembly lines but near completion would be rushed into operation, along with equipment

Lockheed C-130s on Flight Line



Here are four 62-ton C-130 Hercules turboprop transports on the flight line at Lockheed's Marietta, Ga., plant. Big Air Force freighters are in quantity production. Powerplants are four Allison T-56 turboprops, rated at 3,750 hp each.

undergoing ramp and flight tests. Prototype models would be converted for combat use and equipment far back on the assembly line would be "cannibalized" if necessary to repair damaged equipment.

To carry out these objectives, a maximum work week would go into effect, and workers engaged in fabricating and other activities would be diverted to the assembly line. Normal inventories of finished components and sub-assemblies would be drained for the last-ditch work.

In working out emergency production compression plans with industry, the Air Force will follow these basic assumptions: the assembly plant remains intact, no additional personnel will be available for the all-out production period, no support will be forthcoming from other suppliers, all but local transportation facilities will be destroyed, and only high-priority messages may be communicated.

No Pell-Mell Rush

• "Production Acceleration" is very different from the pell-mell production effort which would be required in the first days of a nuclear war. It is designed to boost production of tactical and supporting systems in an orderly way to a peak rate in as little as three to four months instead of the one-year period normally required.

The acceleration program envisages the advance purchase of rod, wire, bar, sheet, forgings and other semi-fabricated material by suppliers of major components such as engines, structural sections and landing gear so that steps to increase production can go into effect immediately after the start of the local war.

Unlike the problem posed by advance buying of finished components and sub-assemblies, there is little danger that engineering changes will be so significant as to out-mode such elemental things as forgings. Therefore, the AF plans to push ahead with advance-buying plans for these items without much delay.

According to Col. Warner E. Newby, Chief, AF Mobilization Division, advance purchase of semi-fabricated material for selected weapons systems under the "Production Acceleration" program will mean an increase of not more than 5% to 10% in initial AF spending. He said the heaviest advance buying will take place for materials required to produce the longer lead-time items like landing gear, with relatively modest buying for short lead-time items.

Col. Newby emphasized that all the material bought under such programs would eventually be used in the normal procurement of the weapon system and

British Agricultural Plane Makes First Flight



The Auster Agricola agricultural aircraft, designed and built for aerial fertilizing service in New Zealand, has made its first flight from Auster's factory airfield at Rearsby, England. Powerplant is a 240-hp Continental. The Agricola can take off in 750 ft. with 1,700 lbs. of fertilizer.

that the only extra charge would be for storage and insurance of the material before it is finally consumed.

Production compression will affect the plants of airframe and missile assemblers exclusively; in fact, they cannot look to any of their suppliers for support. They will be expected to carry out their emergency assignments regardless of the consequences to the orderly flow of their production systems.

Production acceleration, on the other hand, has its principal impact on producers of components, sub-assemblies and parts. The prime contractor will be affected only to the extent he fabricates some of the sub-sections himself. In his capacity as final assembler, however, the production acceleration plan will have little effect on him, although he will be responsible for developing acceleration measures with his suppliers.

• The AF expects to begin working out emergency production plans of both types with industry producers some time this year. In general, these plans will be developed in the normal course of business. Future supply contracts for the selected high-priority weapons will contain provisions assigning each contractor responsibility for preparing readiness measures and emergency manufacturing plans.

The AF readiness plan sets up three categories of equipment, "A," "B" and "C," for which appropriate readiness measures will be developed on a descending order of priority. The first two categories include the AF list of minimum wartime aircraft and missile needs, while the third includes supporting items like trainers, flight simulators, oxygen masks and the like.

Category "A" includes weapon systems "which must be kept in active production under the most austere

emergency conditions," according to the memorandum. "B" items will be produced under "adverse conditions," but under "extremely austere emergency conditions, surviving production capacity for this category would be reprogrammed to support production of Category 'A' systems as required." Category "C" covers "all remaining weapon systems and supporting systems for which production planning is desirable."

• Actual priorities assigned to the various weapon systems now in production for the AF are classified, but there can be little doubt that the B-52 bomber, some of the Century series of fighters and the Falcon air-to-air missile will be included in Category "A," along with at least one tactical weapon like a fighter bomber. The balance of the AF aircraft and missile systems now in production—mostly tactical and support systems—will be assigned to "B."

In addition to dispersal of production facilities to minimize attack damage, the AF laid down certain other goals for "A" and "B" items to be achieved where current procurement needs permit: establishment of two production sources for each, maintenance of one source in production while shifting the other to a follow-on model, maintenance of readily expandable two-shift operations for strategic and air defense equipment, and single-shift operations for tactical and supporting systems.

At present, the AF readiness program is hardly more than a piece of paper. The first assignment of weapons priorities is expected in a few weeks, with a more comprehensive list to come in May. Certainly a great amount of additional work will be necessary before the plan becomes an effective working program.

◆◆◆

FORD INSTRUMENT

solved one design problem by

CASCADING RESOLVERS

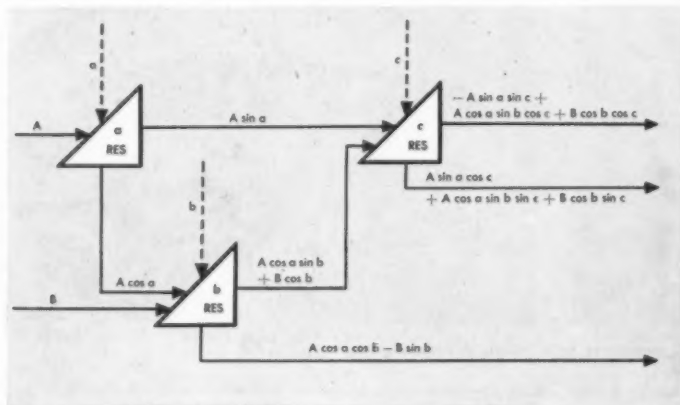
WITHOUT

ISOLATION AMPLIFIERS

To get around a problem that arises in almost every resolver application Ford engineers recently designed a computer which, among other things, employed a chain of cascaded resolvers to solve complex trigonometric equations, without the use of isolation amplifiers. They solved such an equation as:

$$A \sin a \cos c + A \cos a \sin b \sin c + B \cos b \sin c$$

This was successfully done, without use of vacuum tubes or amplifiers in this circuit:



In view of the widespread use of resolvers to generate sine and cosine functions in modern electro-mechanical analogue computers, it is of great practical significance. Resolvers produced by the Ford Instrument Company have now reached such a high degree of precision, that it is possible to obtain, from an unloaded resolver (which accommodates a single angular quantity only), an accuracy to within less than one tenth of one percent. But most computing circuits call for the use of several resolvers, and once an ordinary resolver is loaded by another resolver, no matter how high its precision, the overall accuracy of the resolver cascade is seriously affected.

The conventional method of avoiding this difficulty is to use an isolation amplifier for each resolver, so that the resolver continues to operate under no-load conditions regardless of the size of the cascade. The importance of cascading without amplifiers is readily appreciated if we realize that the isolation amplifier usually increases the cost of the equipment, more than doubles the size and generates many times more heat that must be dissipated to prevent breakdown of the components. Furthermore, the use of vacuum-tube amplifiers always raises the problem of tube ruggedness and reliability, and requires an additional source of d-c plate voltage.

Have you problems which the engineers at Ford might solve by designing and manufacturing computers, controls or their elements? Write for further information.



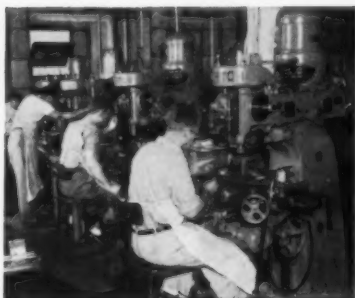
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Ford's capabilities are among the finest in the country



One of the Ford laboratories where a particular design project has called for careful study of resolvers and resolver cascading. Two of the engineers assigned to this project are here checking results. From this work will come one of the new, highly classified weapon systems for the armed forces.

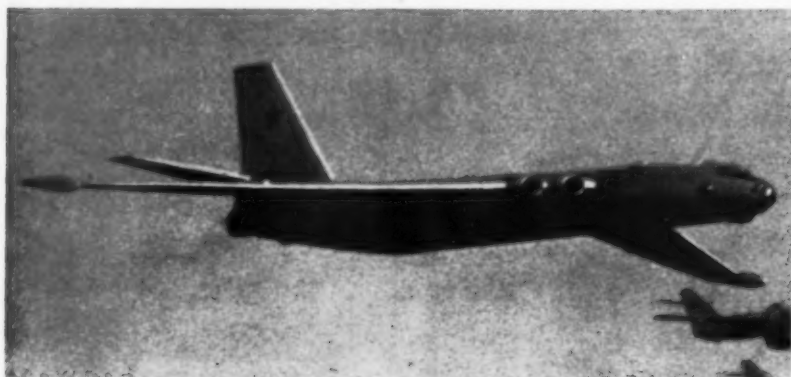


For accuracy and reliability—both vitally necessary in military instruments—experienced machinists must work to fine precision—in the order of .0005 of an inch. Here in one section of the shops of Ford Instrument Company, men are milling parts for an airborne computer.



During the past year Ford Instrument Company has been busy working on many contracts for the U. S. Air Force and the U. S. Navy Bureau of Aeronautics, designing and manufacturing complex computers, controls and their components. For over forty years, Ford Instrument Company has devoted most of its efforts in working for the government to the many problems of weapon controls.

Who's REALLY Ahead in U.S.—Russia Airpower Race?



Four-jet Type 37 Bison is in the same intercontinental category as . . .

"The Russians have more aircraft but the U.S. is ahead in quality."

That has been the standard Defense Department line over the past few years as the Soviets were making the transition from emphasizing an air defense force to a buildup of their own version of Gen. Curtis E. LeMay's Strategic Air Command.

Intelligence data is sketchy so no one in the Pentagon knows for certain that the U.S. is really ahead qualitatively. Soviet displays of air strength in 1955 indicated they do have in production an aircraft capable of reaching the U.S. in the Type 37 Bison.

Only in the medium-bomber field is the USAF certain that it is ahead. With about 2,000 Boeing B-47 Stratojets on



MiG-17 Fresco roughly compares with North American's supersonic F-100.



In the subsonic interceptor class are Northrop's F-89D and the Yak-15.



Frequently meeting in Korea were the NAA F-86F and the MiG-15 Fagot.



hand, the Air Force certainly has more planes in this category than the Russians have Type 39 Badgers.

Official estimates place the number of Russian military planes at about 20,000—a number which is probably growing constantly.

To meet this challenge, a Republican member of the House Armed Services Committee, Conn. Rep. James T. Patterson, has urged President Eisenhower to accelerate attainment of the USAF's 137 wings. Under present programs the 137 wing goal will be reached in July 1957.

The accompanying photos (from *Naval Aviation News*) show some of Russia's latest planes and their nearest U.S. counterparts. ♦♦♦



... the USAF eight-jet Boeing B-52.



Type 39 Badger and Boeing B-47E are the standard medium bombers.



Hundreds of Russian Navy Bosuns and Martin B-57 light bombers have been built.



Yak Horse is strikingly similar to Piasecki H-16.

Satellite Rockets Will Have No Fins

By HENRY T. SIMMONS

The three-stage rocket propulsion system the Navy is providing for the 1957-58 International Geophysical Year satellite program involves a radical "new look" in rocket design: no fins.

Designers of the Project Vanguard launching system have decided to rely entirely on the thrust of the rocket motors, mounted in gimbals and controlled by gyroscopes, to govern the longitudinal attitude of the vehicle in its upward flight.

This is one of a number of Project Vanguard construction details learned by AMERICAN AVIATION. Although the program is still in its early stages, and many additional design and engineering decisions are still to be made, it is now possible to present a fairly detailed picture of the actual construction and workings of the launching project.

• The decision to dispense with fins was an outgrowth of an extensive study program conducted by The Glenn L. Martin Co., Baltimore. Departure point of the Martin study was the well-known fact that fins are relatively useless in the early stages of rocket flight when speed is low, as well as in the later stages when the rocket is beyond the atmosphere. Furthermore, it was known that fins produce undesirable moments of roll in rockets.

The Martin study, which included the experimental firing of small, finless rockets, indicated the feasibility of doing away with fins altogether in the Vanguard system. The decision means a substantial saving in the dead structural weight of the vehicle, plus a reduction in atmospheric drag.

• The Office of Naval Research is supervising the over-all satellite-launching program, with technical responsibility in the Naval Research Laboratory, which has broad experience in high altitude rocket research. NRL awarded Martin the prime contract to build the rocket-launching vehicle itself in view of Martin's past experience with the Viking research rocket.

G.E. Has Subcontract

Subcontracts have been awarded General Electric Co., Schenectady, N. Y., to build the rocket motor for the first stage of the vehicle, and to Aerojet-General Corp., subsidiary of General Tire & Rubber Corp., Azusa, Calif., to supply the powerplant for the second stage. Several companies are competing

for a subcontract to supply the motor for the third stage, which will carry the instrumented satellite itself, but no decision has been made yet.

Except for the absence of fins, the first stage of the Vanguard rocket is basically similar to Martin's Viking. The GE rocket engine, however, will have substantially greater power and efficiency than the Reaction Motors, Inc., powerplant used in the Vikings. The GE engine has a sea level power rating of 27,000 pounds thrust, compared with 21,000 pounds for the Reaction Motors model.

• The GE engine is designed for a total operating time of 140 seconds. The propellant will be a mixture of gasoline, ethyl alcohol and silicone oil. The oxidizer will be liquid oxygen. The propellant will be forced into the thrust chamber by turbine-driven pumps after circulating about the chamber as a coolant. The turbo-pumps will be powered by steam generated from hydrogen peroxide.

The rocket motor itself will be mounted in a gimbal with flexible high-pressure lines leading to the thrust chamber. The gimbal mounting will permit a deflection of the motor exhaust up to five degrees in any direction from the longitudinal axis of the rocket. The first-stage hull will have a cylindrical monocoque configuration with skin, structural members and integral fuel tanks.

The second stage rocket motor

which Aerojet is building will have a regeneratively-cooled thrust chamber in a gimbal mounting like the GE engine in the first stage. The fuel will be dimethyl-hydrazine and the oxidizer will be nitric acid. Helium under high pressure will force the fuel and oxidizer into the thrust chamber. Thrust and firing time aren't known.

• The third stage of the Vanguard assembly will be powered by a solid propellant motor, in contrast with the liquid fuel motors of the first two stages. It will consist of the motor, an attachment to the structure of the second stage, the satellite itself and the structure for holding it in the third stage until it is to be released.

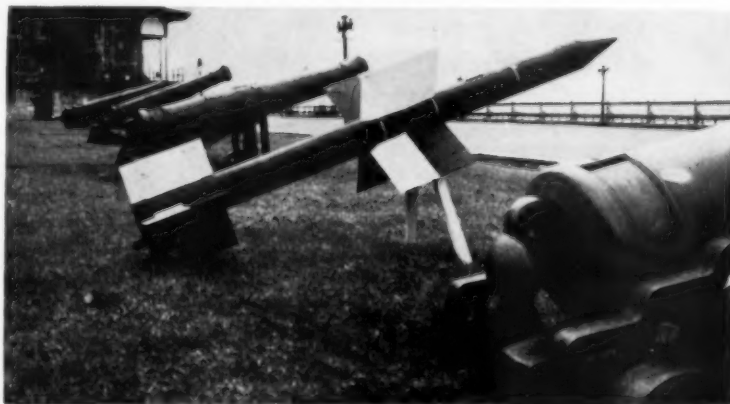
How It Will Be Done

Though final details of the actual launching of the satellite will have to be worked out with considerable precision, here's a rough picture of the operation based on present designs:

• The satellite will be fired from Patrick Air Force Base at Cape Canaveral on the east coast of Florida. The first stage will carry the assembly straight up for the first few miles, then incline gradually toward a horizontal, southeasterly trajectory. When its fuel is exhausted, at an altitude of about 40 miles, the first stage will drop into the sea. At this point, the vehicle will have a velocity of about 4,000 miles an hour.

• The second-stage rocket will commence firing at the burnout and separa-

Canada's Old and New Artillery



Sandwiched between vintage cannon is Canada's Velvet Glove guided missile, an air-to-air test vehicle. Missile recently was exhibited at Quebec City. Canadair Ltd. built missile from design of the Canadian Armament and Development Establishment.

ENGINEERS



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\$38,688,383		\$154,588,816
	EARNINGS COMMON SHARE	
\$4.13		\$6.33
	BACKLOG	
\$62,695,281		\$305,438,023*
	TOTAL PERSONNEL	
5,560		13,785
	ENGINEERS	
961		2,654

* Backlog has since virtually doubled

MCDONNELL

Aircraft Corporation

McDonnell XV-1 Gets a New Look



Addition of a redesigned pylon cap (above insignia) materially reduces drag interference between McDonnell Aircraft's XV-1 hub and pylon. Company says it also will improve efficiency of the convertiplane. XV-1 is in flight test development. It is powered by a 550-hp Continental engine.

tion of the first stage. It will carry the remainder of the assembly to an altitude of about 130 miles before it, too, burns out. At this point it will be moving about 11,000 miles an hour in a course deflected from the vertical.

- The remaining assembly will then "coast" up to an altitude of about 300 miles at the cost of some slight loss of velocity. During this period, the gyroscopes of the second stage will adjust the attitude of the final rocket stage to a horizontal course in the direction of the satellite's ultimate orbit.

Then the second stage will be detached and the third-stage motor will begin to fire and will accelerate the satellite to its orbital velocity of 18,000 miles an hour. When it burns out, it will separate from the satellite and the device can then begin to transmit information by radio to receiving stations on the Earth.

- Adjusting the course of the third-stage rocket will be one of the most critical problems of the entire launching process. The final projectile must be directed "as nearly horizontally as guidance accuracy will permit," according to Dr. Homer E. Newell, Jr., of the Naval Research Laboratory. An error of more than 1.5 degrees either way would throw part of the orbit of the satellite below an altitude of 150 miles, with the result that its life-span would be significantly reduced as it dipped into the denser portions of the atmosphere.

If all goes well in the launching process, however, the final orbit of the satellite will be an elliptical shape with a perigee—point of nearest approach—of 200 miles, and an apogee—point of greatest distance from the Earth—of about 800 miles. Its lifetime would last a few days to a month or more, according to present estimates.

It's expected the satellite will make one revolution of the Earth every 90

minutes or less. As the Earth rotates beneath the satellite, the object will describe a different path over the globe on each revolution.

According to Dr. Newell, "the track of the satellite over the ground will wind around in a sort of sine wave between a maximum latitude north, and an equal maximum latitude south." This he points out, will present a difficult tracking problem for ground stations.

- Two other factors further complicate the tracking problem. One is atmospheric drag, which will gradually reduce the speed of the satellite—eventually to the point that it will fall into the denser part of the atmosphere and burn up. The other complication results from the fact that the Earth is not exactly round, but "oblate." Its radius is 13 miles greater at the equator than at the poles. Since the satellite's orbit will be at an angle to the equator, the excess mass of the Earth will tend to pull the satellite out of its orbital plane on each passage so that the orbital plane itself will gradually rotate in space.

Weight Problem Knotty

Another knotty problem confronting the Vanguard is that of weight. Too much weight in the satellite and it would never achieve an orbit, too little and it would be scientifically useless. Based on present design thinking, the artificial "moonlet" should be about 20 inches in diameter and have a weight of 20 to 30 pounds.

It's expected that about one-fourth of its weight may be devoted to scientific research instrumentation and power supply. The balance will be reserved for the structure of the satellite itself, a tracking transmitter, devices for turning the equipment on and off, and a separate power supply.

- At least as difficult a problem as weight is that of heat, both on the up-

ward trip of the satellite and while it's in the orbit. For example, if the satellite is placed in the nose of the third-stage rocket, it will be subjected to a temperature of 1,000°F or more during the early part of the launching. To lick this difficulty, though at some cost in weight to the first and second stages, a conical nose section may be fitted over the satellite and detached at the end of the second-stage flight period.

While in its orbit, the satellite will be subjected to extreme temperature variations—400°F in sunlight and below zero in the Earth's shadow. Some means must be devised for stabilizing the internal temperature of the satellite because transistors and other electronic equipment probably cannot be designed to survive temperatures below 40°F or above 120 degrees.

These are just a sample of the host of engineering problems confronting the Vanguard designers, both in industry and the government. That they will finally be solved, no one doubts. The only question is one of time.

The earliest estimate yet advanced for launching the first U.S. satellite is September, 1957—the second month of the International Geophysical Year. The Russians boast they'll put a satellite of their own into an orbit sometime in 1956, well ahead of the U.S. model. Whether this claim will materialize remains to be seen. ♦♦♦

B-50s to Get Drogue Refueling Systems

Hayes Aircraft Corp., Birmingham, Ala., received a multi-million dollar contract from the Air Force to convert a "large number" of B-50 bombers to three-point probe-and-drogue refueling tankers for the Tactical Air Command.

The contract was disclosed by Flight Refueling, Inc., Baltimore, which will supply hose reel units to be mounted in each wing tip and in the tail of the B-50s.

The conversion contract "is the first large USAF commitment for the Probe and Drogue refueling equipment manufactured by Flight Refueling, Inc.," the company said. It said TAC up to now has been using KB-29 flying boom tankers "handed down" by the Strategic Air Command.

Hayes will clean up the KB-50 aerodynamically to add a few extra knots of speed in addition to installing the refueling equipment, Flight Refueling said. "With this added speed and equipment to refuel three F-84s or F-100Cs simultaneously, TAC believes the KB-50s will meet its requirements for the next three to five years," it added.



1 "City of Merced" leaves March Air Force Base, heads for Sacramento at 35,000 feet, 500 miles an hour.

2 Approaching target area, K System flies B-47 on precise course, computes bombing data, releases "bomb" at proper instant.

3 Electronic observer shows "bomb" would have landed directly on target.

"CITY OF MERCED" CREW WINS SAC COMPETITION

B-47 Team Pinpoints Sacramento "Target"

THE STORY BEHIND THE STORY:

■ It made September headlines when a most important "Series" was won by a three-man team, a Boeing B-47 bomber and its precision electronic equipment. The "Series" in this case was the annual competition to test the effectiveness of bombing and navigation by our Strategic Air Command. Top-flight crews from SAC bases each flew 9000 miles on simulated missions, demonstrating the extreme accuracy of our strategic bombers.

■ Piling up more points than any other team in the contest, the men of the "City

of Merced" earned the title of "the world's deadliest bomber crew." On one of their runs the target was the northeast corner of an industrial plant in Sacramento. Flying nearly seven miles above the earth and at a speed of nearly 500 miles an hour, the "City of Merced" dropped its "bomb" within a stone's throw of the designated target.

■ Working all the way for the Navigator-Bombardier-Observer was the K Bombing Navigation System. This system, developed for the Air Force by Sperry, first sighted the target by radar. With the Observer keeping the cross-hairs directly over the target on the radar scope, the K

System automatically navigated, flew the plane, compensated for the effects of speed, altitude and wind on the "bomb" to be dropped, and then released the "bomb" at the exact instant required to assure the direct hit.

■ SAC's rigid competition is dramatic proof of what the Air Force is doing to discourage possible aggressors—by making certain an aggressor nation will be hit surely and swiftly should it take beligerent action. And the K Bombing and Navigation System is another example of Sperry's ability to produce equipment which helps assure the success of military missions.

SPERRY **GYROSCOPE COMPANY**
Great Neck, New York
DIVISION OF SPERRY RAND CORPORATION



HELICOPTER MEDICAL MISSION CROSSES AFRICA—Crossing African jungles and bushland from Leopoldville, Belgian Congo, to Nairobi, Kenya, the Lederle-Sikorsky Medical Expedition flew 2800 miles in a Sikorsky S-55, distributing drugs and surveying health conditions. The expedition again showed the significant role of the heli-

copter in public health work in Africa. For several years Sikorsky helicopters have been used there in spraying operations to control the tsetse fly, carrier of sleeping sickness, and for other vital health missions. The helicopter's ability to reach inaccessible areas opens new possibilities for the development of equatorial Africa.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS



TO THE ANTARCTIC—Landing on the Coast Guard icebreaker *Eastwind*, a Navy Sikorsky HO4S helicopter joins Operation Deepfreeze, the U. S. antarctic expedition. The *Eastwind* sailed from Boston in November. The HO4S is a Navy version of the famed S-55 which serves in quantity in each of the U. S. armed services and is the standby in commercial and military operations all over the free world.



S-58s FOR COMMERCIAL SERVICE—To enter airline service in the U. S. and Europe in 1956, the Sikorsky S-58 is the largest helicopter made available for commercial service. New York Airways plans to buy 7, Sabena Belgian World Airlines 8, all to be delivered starting in the spring. Both airlines currently use S-55s. The new S-58 will carry 12 passengers and will cruise at more than 100 m.p.h. against the earlier model's 85 m.p.h.



HELICOPTER HISTORY



FIRST SHIPBOARD LANDING

In May, 1943, Capt. (now Brig. Gen.) H. Franklin Gregory landed a Sikorsky XR-4 on the deck of the tanker S.S. *Bunker Hill*, in a successful demonstration of a helicopter's ability to operate from the small deck of a merchant vessel. The demonstration took place on Long Island Sound off Connecticut.

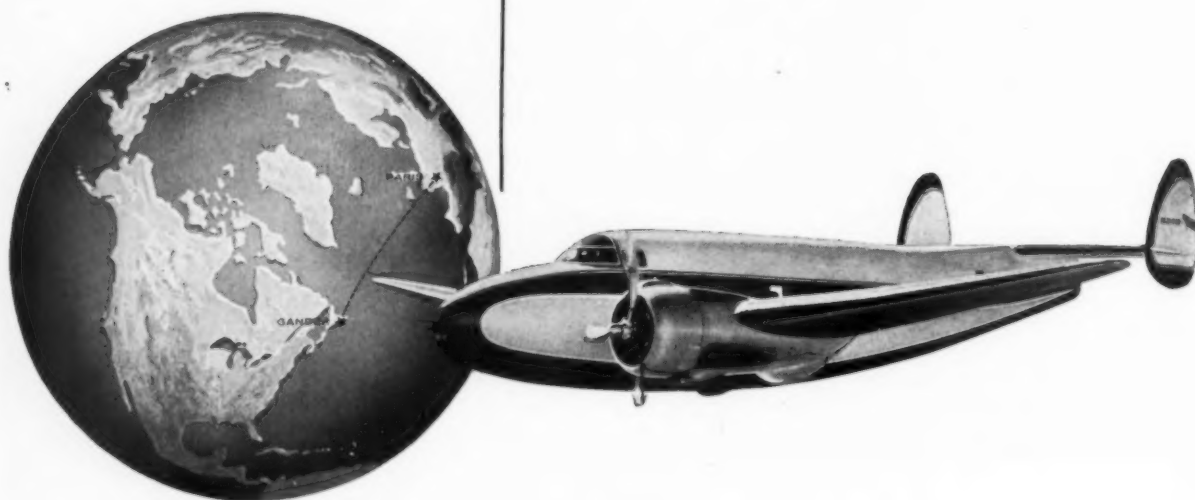
THE MARINES HAVE LANDED—this time, by helicopter, landing on a submarine. And the situation is well in hand, with this unique operation again demonstrating the helicopter's versatility, offering new methods of evacuation for the sick and wounded and new possibilities for emergency supply, as well as new battle capabilities. Photo shows a Sikorsky HRS-1 transport helicopter landing aboard the USS *Sea Lion* during exercises off North Carolina. The HRS-1 is the Marine Corps version of the Sikorsky S-55 helicopter, which is also operated by the other armed forces.



SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT
One of the Divisions of United Aircraft Corporation

PLANE	<i>Learstar</i>
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TIME	<i>8 hours, 50 minutes</i>
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The World Flies

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Airlines Take New Look at Old Noise-Killer

"Propeller Synchrophasing," Hamilton Standard's 10-year-old development, reconsidered by airframe makers as TWA adopts it for Super Connies.

By JOSEPH S. MURPHY

Airlines seeking lower noise and vibration levels in today's transports are taking another look at propeller "synchrophasing," a 10-year-old development by United Aircraft Corp.'s Hamilton Standard division.

Recent tests by airframe manufacturers show the device will cut noise by as much as 16 decibels in certain cabin areas of a four-engine transport. Similar trials on a twin-engine transport produced a four to 15 db reduction.

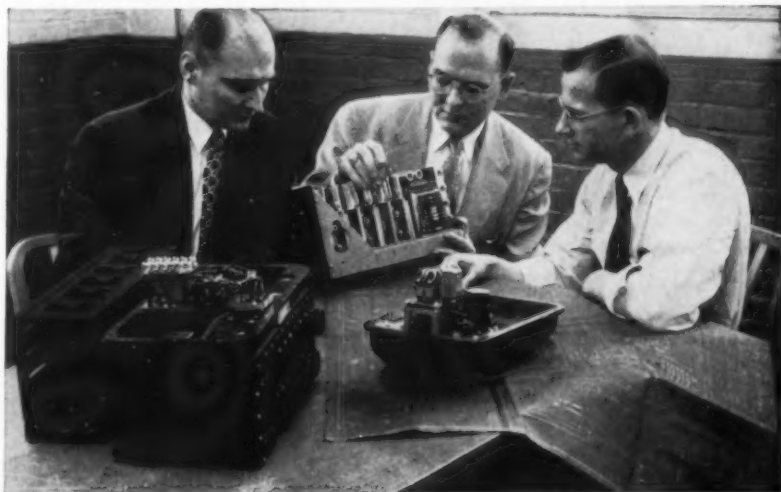
Proof of just how successful these demonstrations have been is the decision by Trans World Airlines to make it standard equipment on its new Lockheed 1649A Super Constellations slated to enter airline service early next year.

• In addition, Lockheed, Convair and Douglas have tested it on current Constellation, 340 and DC-7 aircraft and other airline tests are in the mill. These include evaluations by Pan American World Airways on a Boeing 377 Stratocruiser and by United Air Lines on a DC-6.

Announcing TWA's firm order for the new prop control on its 1649As, Hamilton Standard general manager Erle Martin explains the sudden, renewed interest in synchrophasing. The device, Martin says, was originally developed as far back as ten years ago, but was shelved at that time for lack of customer interest. Now it has been revived because of the increased problems of noise and vibration resulting from today's higher engine powers and larger propellers.

What synchrophasing does is to go a step beyond mere propeller synchronization (RPM control) to keep the blades of all props in the optimum position for lowest cabin noise and vibration. When synchrophased, all props turn at a selected angular relationship to each other with the net result that the number of propeller "beats" and amount of vibration transmitted to the fuselage is no longer a hit-or-miss proposition.

• Originally, according to Martin, the task of keeping all propellers of a four-engine aircraft in phase was dismissed as impossible—at least without



Hamilton Standard engineers A. Dembkowski, C. Brahm and F. Beatrice examine major synchrophaser components. At left is electromechanical unit, at right electronic control.

heavy, elaborate equipment. Many factors—high rpm, inertia, mass and others—all affected the extreme phase accuracy required and imposed a staggering engineering job.

As far back as 1935, Hamilton Standard experimented with a unit using differential gears and pulleys to synchrophase propellers of two engines, but the unit proved both cumbersome and erratic. Later, working in conjunction with the Woodward Governor Co., H-S first tried a hydraulic synchrophaser, then an electric. And although this latter activity finally evolved into the prop synchronizer now used by most airlines, it did not solve the noise problem.

What H-S has now developed by electronic means is a 35-lb. system that will keep "slave" propellers in phase with a "master" prop within 15-degrees, and even better than that in smooth air flying with properly functioning engines. Hamilton Standard estimates the weight of synchrophaser components of a four-engine transport at 60 lbs.

• Here's how it works. A magnet is installed on each propeller and a coil in each engine nacelle. As a magnet passes a coil, it sets up a voltage pulse which represents each blade angle. This pulse is then carried to an electronic

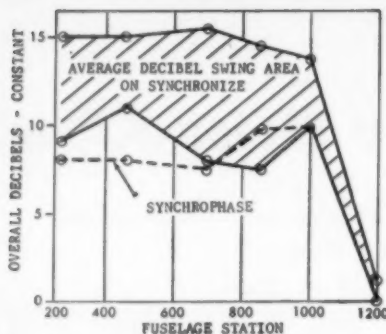
control which compares the timing of pulses from each nacelle and, where it varies even by a small fraction of a second, the difference is registered and corrected.

To do this, one propeller is selected as a "master" and all others become "slaves." When the impulses from the various engines are fed into the synchrophaser, their timing is compared with signals from the master propeller to determine whether or not prop blades are staying in phase.

The output of the synchrophaser is a dc voltage (one circuit for each slave propeller) proportional in both magnitude and polarity to the phase difference between the master and slave propellers. This control dc voltage is passed through a derivative circuit for stability and is then converted to ac in a 400-cycle chopper.

Phase of the ac voltage is dependent upon the polarity of the applied dc voltage. The ac signal is then amplified and applied to one winding of a two-phase ac motor while standard 400-cycle aircraft voltage is constantly applied to the other winding.

Rotational speed and direction of this motor is then proportional to the amplitude and phase of the control voltage which, in turn, is proportional to



Sound level variation in Super Constellation cabin (with a constant level subtracted). Synchrophasing cuts overall sound level, reduces these variations.

the phase relationship between the master and slave propeller.

This two-phase motor drives a commutator switch assembly which produces a square-form, three-phase, ac voltage. This voltage is supplied to a three-phase electric motor mounted on the engine governor which moves the governor pilot valve and meters oil to the increase or decrease side of the pitch change mechanism in the propeller.

This then brings about the slight decrease or increase of rpm, whichever is called for, to return the slave propeller into phase with the master.

• The only major limitation on the synchrophaser is range—it can only adjust slave propellers about 20 rpm. This prevents the slave props from following the master to zero in the event of a master engine failure.

Basic components of the system are the four pulse generators, electronic unit, electromechanical unit and a manual phase control panel.

Each pulse generator consists of a pick-up coil mounted on the non-rotating portion of the propeller along with necessary attaching parts. Each coil measures about 1 in. x ½ in. x ½ in. and a pulse generator weighs approximately 1.5 lbs.

• The electronic unit is of standard rack and panel construction with shock mounting for fuselage installation. Weight is about 18.5 lbs. and dimensions 5¾ in. x 7¾ in. x 17½ in.

Heaviest item is the electro-mechanical unit which is housed in cast aluminum, weighs 33.5 lbs. and is similar in outward appearance to present four-engine synchronizer assemblies.

The prop phase control assembly consists of an illuminated panel containing three potentiometers. The unit measures about 6 in. x 3 in. x 4½ in. and weighs close to 13 ounces.

As to noise reduction results that can be expected from synchrophasing, the most detailed information available

is on Lockheed testing of a Super Constellation. During a recent west coast Society of Automotive Engineers' session, Lockheed's G. E. Sanderson reported that variations as high as 15 db in noise levels could be produced by changing propeller phasing from the worst to best condition.

• Sanderson points out that the amount of reduction shown in Lockheed tests was impressive, yet its true importance has not been revealed. In virtually every discussion of the problems of soundproofing transports it has been generally concluded that higher frequency noise is the easiest to reduce within usual weight limits, and that considerable weight is needed to cut sound levels in the low frequencies.

With synchrophasing, Sanderson adds, it not only lowers cabin sound levels, but does it in the low frequency region that has given manufacturers their biggest headache in soundproofing.

Actually, the Lockheed engineer figures, the whole theory is a long way from complete. At first it was felt that by phasing the pressure impulses of opposite propellers on the fuselage, internal pressure fluctuations would be reduced.

Data compiled by Lockheed with its "breadboard" synchrophaser, however, showed that phasing of two propellers on one side was considerably more important than any attention that might be given propellers on opposite sides.

• For example, Sanderson explains, if the phase of both left-side propellers (Nos. 1 and 2) was held very carefully to the optimum condition, it was possible to lower the sound level as much as 11 db from the worst situation without giving any thought to the phase angles of the other two props.

This would indicate the probability that the noise in the cabin, considering acoustic transmission, is reduced by

proper positioning of "beats" from two propellers on one side. A second possibility is that the acoustic energy is transmitted to the fuselage through the wing, and that the phase angle of propellers with respect to prop blast over the wing must be timed so that the transmission through the wing to the fuselage creates cancellation.

Neither of these theories, says Sanderson, is wholly satisfactory.

But beyond the out-and-out advantages of any noise reduction, he points out, the psychological aspects of synchrophasing are also important. A high noise level in the frequency range (below that of the speech region) is not particularly annoying unless it is continually varying.

• In the low frequency region, a high noise level that is steady is easily accommodated by the human ear in a few minutes. But if that noise level varies as much as three to five decibels consistently at a very low frequency, it is extremely annoying.

If this high noise level can be reduced effectively by adding equipment weighing about 50 lbs., concludes Sanderson, it is easy to see that it is well worth while.

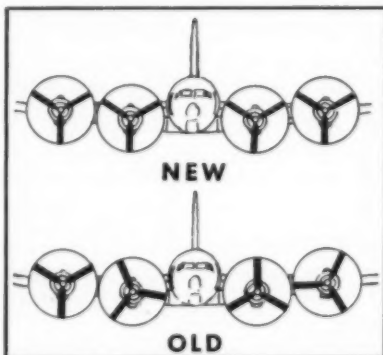
Another indication of thinking among manufacturers on the potential of synchrophasing is a statement by an airframe acoustics engineer, presumably referring to a twin engine aircraft. He says that phase synchronizing achieves sound and vibration improvements which could otherwise be attained only through addition of perhaps 800 lbs. of soundproofing and additional structure. But, he notes, the equipment for synchrophasing will add only about 35 lbs. to the airplane. ♦ ♦ ♦

New Metallurgy Used By Solar Aircraft

New metallurgy is involved in the engine nacelle barrels Solar Aircraft Co. is producing for Lockheed Aircraft Corp.'s new Model 1649A Super Constellations. In addition to quarter-hard and full-hard No. 302 stainless steel, the Model 1649A assemblies require type 17-7PH, a precipitation hardening stainless, and type AM 350, a cold hardening stainless steel.

Heat treat on AM 350 presents unusual requirements, necessitating a two-hour freeze cycle at 90 degrees below zero, then tempering for two hours at 750°F.

For the Model 1649A, Solar is building engine nacelle barrels from the powerplant firewall back, over and under the plane's wings, and also upper and lower aft structures, fairings, panel and accessor doors, and main landing gear doors.



Oversimplified sketch (top) distinguishes synchrophased props from those merely synchronized (below). Actually, outboard blade positions are offset from those of inboard props to blend their "beats" on the fuselage into one impulse.



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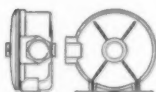
G-159J and G-198J—
Main line hydraulic,
monel or stainless ele-
ment, aluminum body.
Knife blade cleaning.
Two sizes give wide
range of capacity.



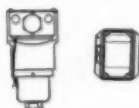
G-200M — Hydraulic
actuating valves and
cylinders. Two-way
restrictor stops dirt
for either direction of
flow. Available with
either internal or ex-
ternal connections.



G-205M — Hydraulic
pipe lines. Light
weight—1 3/4 oz.



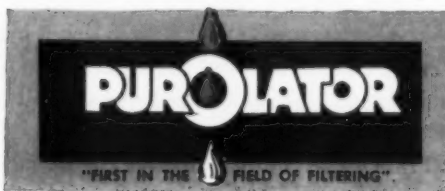
PA-12-B—Intake filter
for instrument air
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T2V-1 Gets Name and New Paint Job



Lockheed Aircraft's new Navy jet trainer, the T2V-1, has been named the SeaStar. First two-place jet trainer for aircraft carrier service, the SeaStar is rated in the 600 mph class. Powerplant is an Allison J33 turbojet. Trainer is decked out in Navy's new orange and white color scheme.

MANUFACTURING

Stunkel Organizes New Aircraft Firm With Insurance Executive's Backing

NATIONAL AIRCRAFT Corp., newly formed by Reagan C. Stunkel following his resignation as vice president of Hydro-Aire, Inc., represents another major aviation investment by John B. MacArthur, president of Bankers Life & Casualty Co. of Chicago.

MacArthur recently acquired 51% control of Midway Airlines, Inc., the expanding Chicago air shuttle service, and a short time later the purchase of American Airmotive Corp., of Miami Springs, Fla. was announced by the Bankers Life company.

Jack Ferris, assistant to the president of Bankers Life, is vice president of the new National Aircraft, and MacArthur himself is on the board.

• The new Stunkel enterprise includes the purchase of two aircraft companies and divisions of two others. More acquisitions are contemplated, Stunkel said. Those in the fold now are:

• National Aircraft Corp., retained as the surviving and administrative company because of the aptness of its name.

• Metropolitan Air Parts, sheet metal fabrication company at Van Nuys, Calif., which now forms the nucleus of the manufacturing division of National Aircraft.

• Western division of the Florida Aviation Corp., which now forms the basis of an aircraft division to engage in aircraft service and overhaul and make electronic installations in aircraft.

• Semi-conductor section of Hydro-Aire, Inc., which forms the basis of National Aircraft's electronics division, called Marvelco.

• National Aircraft has leased 33,000 square feet of manufacturing area together with 33,000 square feet of parking area from Pacific Airmotive Corp. in Burbank, Calif. for its administrative offices and the production of transistors and related items. The manufacturing and aircraft divisions are located at Van Nuys.

R. O. Vaughan, formerly sales manager for Hoffman Laboratories, Inc., is vice president of National Aircraft and general manager of the Marvelco electronics division, which is in production on a line of high-quality semi-conductors and is establishing extensive laboratory facilities to conduct research in a wide range of electronic fields.

Director of research is Dr. Hans

Hollman, post-war professor of high frequency electronics at Friederich Schiller University in Germany and subsequently research scientist at the Navy's Point Mugu missile test center and at Hydro-Aire. Dr. W. R. Sittner, formerly associated with the Bell Telephone Laboratories, is consultant.

Stunkel announced that National Aircraft's manufacturing division plans to market a Stearman agricultural aircraft conversion incorporating a high-lift wing originally developed by Metropolitan Air Parts. Wayne Gosselin, who was president of Metropolitan Air Parts, remains as general manager of the manufacturing division. It also will manufacture ducting systems, airline galleys, integral door steps and other items for aircraft.

• Stunkel described the all-metal structure Model NA-75 wing for Stearman agricultural aircraft as having been designed to specifications laid down by a representative group of aerial applicators after two years' research among them to determine both the aerodynamic and maintenance features best suited to their operations. The wing weighs less than standard panels although the wing area is increased 20%. It is said to contain a number of performance values, including extraordinary stall characteristics (37 mph empty).

Wing assemblies rigged and trammed are available in kit form and are being used by a number of Stearman operators, but National Aircraft has taken an option on a quantity of Stearman fuselages and is completing plans to market a complete aircraft at a price expected to be about \$10,000, Stunkel said. Stunkel also announced the company had retained the services of Nick Spaise, widely known hopper designer, to design new applying equipment for its Stearman conversion.

Stunkel, organizer and president of the new company, has a wide background of experience in both the airline and manufacturing ends of the aviation business. He was general service manager for Lockheed Aircraft Corp. and president of Aviation Maintenance Corp. before becoming vice president of Hydro-Aire. ♦♦♦



HIGH-LIFT CROP DUSTER—Stearman agricultural aircraft conversions with new airfoil will be marketed by new National Aircraft Corp. for approximately \$10,000.

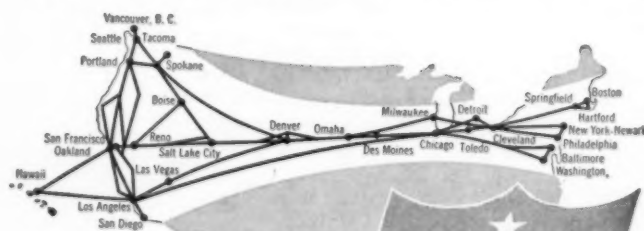
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Air Traffic Control: How Much Military Integration?

Report of Radio Technical Commission for Aeronautics Special Committee 69 weighs pros and cons of three types of systems.

By HENRY P. STEIER

Among the welter of claims and proposals for best ways to expand the air traffic control system capability, the issue of using Air Defense radar facilities has loomed large. The question of just how far the civil system should be integrated into the Air Force's SAGE (Semi-Automatic Ground Environment) system has evoked controversy involving both economic and operational issues.

In 1953, at the request of the Air Force, the Radio Technical Commission for Aeronautics Special Committee 69 took on the job of studying the most economical means of furnishing data from the AF long range radars to civil ATC centers. The radar information would, in general, provide ATC centers with wider coverage over present terminal areas and in enroute areas.

• Late last year, the Air Coordinating Committee approved the implementation of a program that would accelerate evaluation of integration possibilities. ACC proposed a joint CAA-military group to perform the engineering tests and evaluation of CAA traffic control at the AF SAGE installation at Deer Island near Boston.

The report of Special Working Group 13 of the ACC was said last month to be under study by the ACC NAV Panel. It reportedly recommended a "modified" Common System concept. The concept would provide airspace reservations for positive separation of fully equipped and minimum-equipped users of airspace.

SWG-13 finds it impossible to imagine any ATC system as the "ultimate." Rather, it believes, the necessity to keep pace with aircraft performance will result in a continuing evaluation of operational systems which may become interim transitions to better systems on a continuing basis.

The Group endorsed the idea of expanded use of military and civil radars in the Common System, projected radar displays with simplified manual posting, use of direct pilot-to-controller voice communication and use of better methods for transferring and displaying control data.

Pointing to handicaps to ATC operations that exceed "tolerable limits," the Group cited budgetary limitations as one cause of present system "patching." Also, it called for better coordination of military and CAA activities on

Common System projects and establishment of an ATC advisory team.

Prior to the ouster of Fred B. Lee as Civil Aeronautics Administrator, the CAA was accused of slowing progress toward making fuller use of Air Defense radars in a Common ATC System. At this time the integration program is being sponsored by the Air Navigation Development Board.

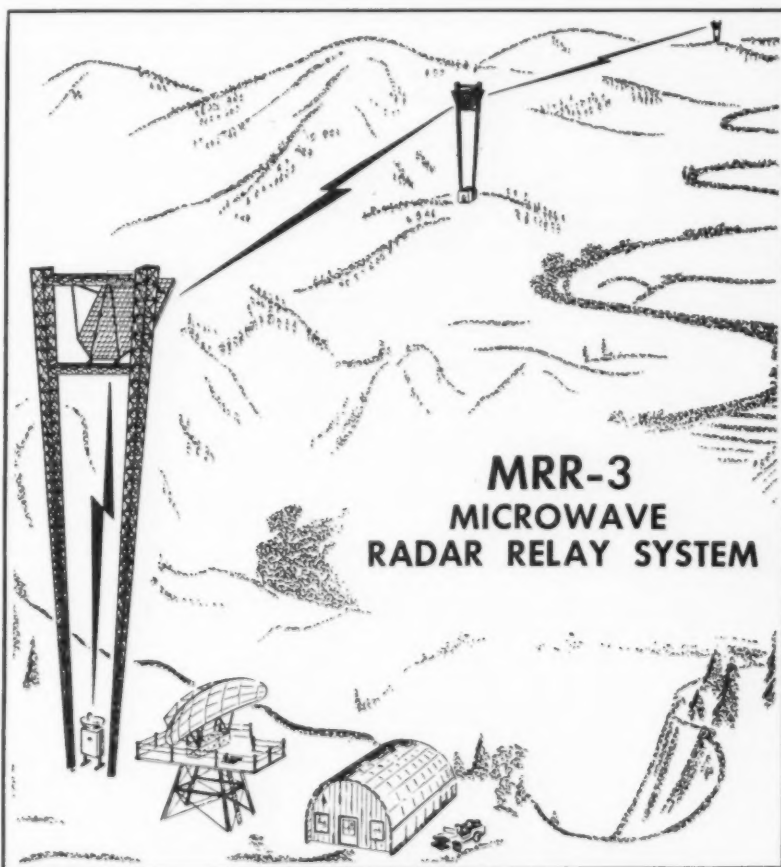
Economic Question Argued

The Civil Aeronautics Board and the ACC, in December, questioned whether the national economy could justify multi-billion dollar expenditures for ATC. They found the possibilities in SAGE "rather tempting" but opposed positive control of all aircraft at all times since they felt it would restrict a large

segment of aircraft operations.

The Board argued that air traffic regulations must distinguish between the period in which the "see and be seen" concept can be applied, and that in which separation must be provided by airways traffic control. In the interim period, CAB believes, airways ATC cannot deny the use of control areas to flights under conditions where visual flight rules are permissible.

• On the other hand, Lieut. Gen. Joseph Smith, MATS commander, speaking before the assembly of the Radio Technical Commission for Aeronautics last fall, argued that a primary ATC problem is the inadequacy of the "see and avoid" system, aggravated by increased aircraft closure rates, particularly with jets at high altitudes.



The Motorola, Inc. MRR-3 microwave radar relay system towers for "line of sight" transmission of radar information from defense radar sites to civil air traffic control sites. Designed primarily for use with intermediate and early warning radar systems, this equipment operating in the 7125 to 7424 megacycle band was suggested by SC-69 as a possible "ultimate" technique for air traffic control data remoting.

Said Gen. Smith: "The only substitute appears to be positive control of all air traffic under all weather conditions. We must accept the facts and act accordingly. Evolution to this concept must start at higher altitudes and also at lower levels of dense traffic."

Interim systems, the general said, "will cost dollars but will bring progress."

"We must base our budgetary requirements on sound findings and sell the case," he asserted. "Experience has proved that sound findings exist in SC-31 and subsequent future reports of SWG-13. Support must be given this program even if it requires each of us to appear before Congress and substantiate and justify our requirements."

Report of Special Committee 69

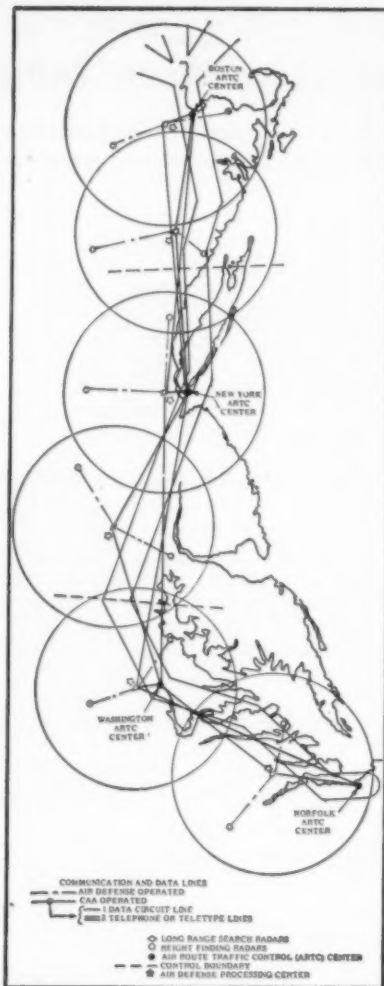
Estimates of what it would cost, and what types of systems are needed for remoting long-range military radar information to civil ATC centers in one high-density traffic area, have been estimated by the Radio Technical Commission for Aeronautics in a report from its Special Committee 69. The Committee has been studying the economics of combined use of defense radars and civil and military ATC radars. The Committee's study covered existing and proposed methods for remoting defense radar data to the point of control for "immediate" use and for "ultimate" use.

Designed to furnish guidance for an objective evaluation of data-remoting systems and techniques that would improve CAA system capacity for control of aircraft movements, the study has been handicapped by lack of current quantitative information. Such parameters as rate of data flow, resolution, system accuracy and system capacity of the Air Defense System were not available. Therefore, the technical adequacy of various remoting systems and techniques could not be measured.

In view of the classified nature of the Air Defense data, SC69 started at the end of the system, that is, at the output of the defense radars themselves.

For an acceptable remoting system, it was assumed satisfactory functioning in a high density area was necessary. The Boston-Norfolk airway was chosen as representing such an area. That airway was assumed to possess a ground radar system capable of providing plan position and height information on all aircraft of interest within the Boston-Norfolk area. Also assumed was that the maximum number of aircraft of interest to CAA by one radar is 100-150 aircraft, and data acquired several times per minute on each aircraft would satisfy CAA requirements.

For the "immediate" case in the



The electronic environment along the Boston-Norfolk airway proposed by Radio Technical Commission for Aeronautics Special Committee 69 for studying the remoting of SAGE air defense radar information to civil air traffic control centers. Circles represent the range radius of air defense search radars.

study, processing of remoted data by the Air Route Traffic Control (ARTC) would be accomplished by human operators and all data-remoting systems would include a display. Personnel or equipment required beyond the display would be considered part of the data utilization equipment.

Ways and means considered for remoting radar information led to analyses of three systems: manual, broad-bandwidth and narrow-bandwidth. On the basis of the assumed operational parameters the Boston-Norfolk area systems costs in the "immediate" case were computed as:

	Installed Cost	Annual Cost
Manual ...	\$2,600,000	\$15,300,000
Narrow-Band ...	245,000	132,000
Broad-Band ...	2,160,000	867,000

Usable radar data for enroute traffic control would be obtained in part from local radars at traffic control points and other information would be remoted from enroute radars to the control point. Integration of data from different sources might be required prior to display and might take place before transmission to the control point.

Since filtering of data could have some value in ATC, operation of a processing center in the defense system was considered. The system works as follows:

- From a radar display observers detect and track aircraft or determine altitude.

- Navigational coordinates of the aircraft, or altitude, together with a track number, are telephoned or teletyped to the processing center from one or more radars.

- At the center, the information is received by an operator who "spots" an appropriate symbol on a large flat area map called a plotting board.

- The display generated is called a symbolic display. Symbols indicate category, speed, altitude, track and identity.

- Information displayed on the plotting board is employed by various persons for different purposes.

For the "ultimate" case, the electronic environment would probably have certain refinements involving a greater density or wider extent of radars within the continental U.S.A. The data processing portion of the electronic environment would probably have greater capability than at present. The International Business Machine air defense computers being built would be installed and would possess capabilities to:

- Accept data from a large portion of an area's search and height-finding radars.

- Track each aircraft of interest.

- Associate with each track any ancillary data such as altitude, size, category and identity.

- Compute scheduling directions for each aircraft.

- Transfer to or accept data from adjacent areas as aircraft leave or enter those areas.

- Display categories of organized, processed data for different interests to the CAA for enroute traffic.

- Possess systematic degrees of timeliness of information.

The manual data-remoting method visualizes personnel at the radar site who voice-tell or teletypewrite the positions of targets appearing on the display to other personnel at ARTC centers. The control of traffic would be accomplished by personnel at the ARTC Center using the plotted information of many zones.

Cost of the manual system was as-

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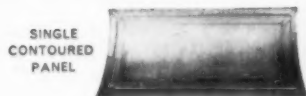
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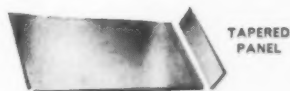
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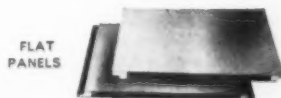
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T-29

"INTERCEPTOR"

THE DEVELOPMENT OF AIRBORNE ELECTRONIC SYSTEMS REQUIRES THOROUGH FLIGHT EVALUATION OF BREADBOARD AND PROTOTYPE EQUIPMENT PRIOR TO FINAL DESIGN. AT HUGHES, SYSTEMS FOR INTERCEPTORS ARE FIRST TESTED IN "FLYING LABORATORIES" IN WHICH THE EQUIPMENT IS READILY ACCESSIBLE TO SYSTEMS TEST ENGINEERS.

One interesting problem recently confronting Hughes engineers was that of evaluating the requirements imposed upon the pilot of a high-speed one-man interceptor. This arose in the development of a new integrated electronic system to control several phases of an all-weather interceptor's flight. Because of the great importance of providing the pilot with the optimum design and arrangement of displays and controls, it became necessary to determine accurately the pilot's work load during flight, and the human factors that affect his ability to carry out his task.

The solution was to install a complete mock-up of the actual interceptor cockpit in a large T-29 aircraft in which a breadboard model of the system was being tested. From this cockpit a test pilot can simultaneously operate the electronic system and fly the T-29, performing all the functions of an interceptor pilot. Systems test engineers and psychologists analyze his problems and his performance, and adapt the cockpit design to the natural abilities of the human pilot. The result will be a much better "fit" of pilot and electronic system prior to final flight testing in the tactical interceptor.



SYSTEMS ENGINEERS

Required are engineers with a basic interest in the system concept, who have the ability to develop new evaluation techniques and conduct highly controlled tests. They should be able to resolve complex circuitry problems, and have sufficient resourcefulness and follow-through to carry a difficult program to its ultimate goal.

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AMERICAN AVIATION

sumed on the basis of the Boston-Norfolk airway with the stated peak conditions. Since operators are part of the data link in this system, the information-handling capacity of the system is largely a matter of numbers of people and telephone lines. The Committee assumes that one line per year would require nine people, including personnel needed at both ends of a line. One line would provide information on six aircraft. However, for some conditions, "the large personnel requirements to manually remote the radar information may prove to be impractical," the committee said. Number of circuits needed would be 22.

An important question in data-remoting systems is the rate at which information should be renewed or corrected. For systems other than the manual one, SC-69 assumed a data rate of every ten seconds. In the manual system the frequency was assumed to be once per minute for each target. This might mean a maximum resolution time of two minutes, which, with high speed aircraft, may involve distances as great as 15 miles, plus a variable delay in telling and plotting. The amount and type of aircraft separations, whether standard AF, Navy or Civil, vertical, longitudinal and lateral or special, would determine the frequency of data correction needed. The Committee said, "No assurance that data are timely or reliable exists for systems of this type."

The broad-bandwidth system could use either coaxial cable or microwave radio relay stations. This system would transfer all of the radar-derived intelligence from the defense radar sites to ARTC centers. Coaxial cable was found to have economic application only for short distances and was not considered in SC-69's report.

Equipment for the broad-band system would be similar to that used for television remoting. Typical of such equipment is Motorola Inc.'s Communications and Electronics Division MRR-3 Microwave Radar Relay System. A similar system is reported to be under design for the AF at Rome Air Development Center.

Composite Video Signal

• Using the broad-bandwidth system, data from the defense radars would appear at the ARTC centers as a composite video signal containing exactly the same data as at the radar site. Also, the system capability is such that ancillary data not originally planned or available could be transmitted as new data handling and production methods are found. Radio beacon transponder video signals and moving target indicator signals could be transmitted. Height data could be part of the video display

Computer Predicts Performance Characteristics



Latest electronic engineering tool installed at Hamilton Standard, division of United Aircraft Corp. is this analog computer that permits engineers to predict the performance characteristics of a new automatic control or other designs under extreme conditions.

With this computer, problems involving matters such as altitude, speed, temperature, pressure, etc. can be set up and results shown on an oscilloscope. A switch of the controls produces changes in the system under design which previously involved expensive and time-consuming redesign and re-manufacture.

installed in an ARTC center.

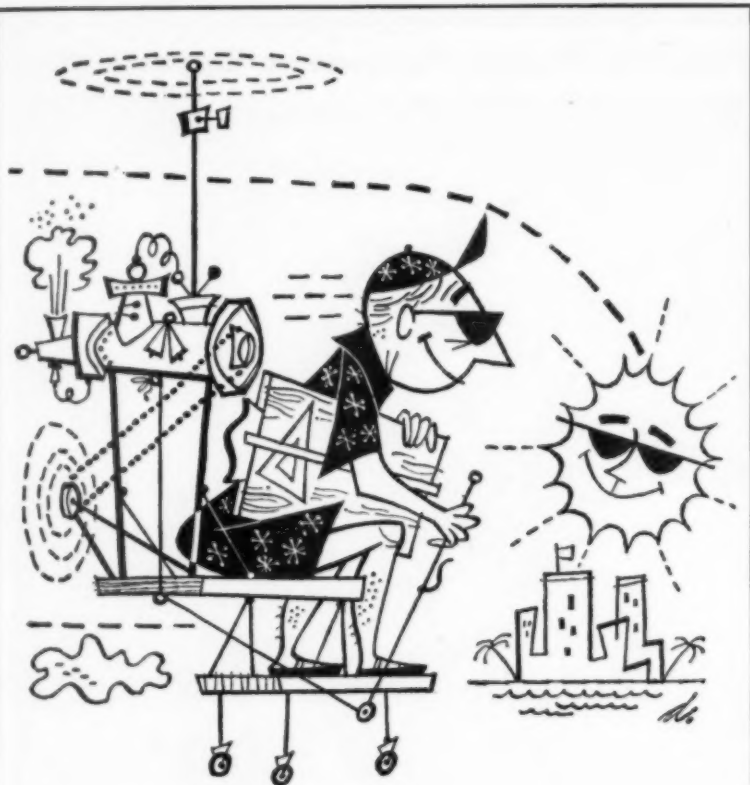
With the broad-bandwidth system, the human error factor in transmission would be removed, and the time-lag between appearance of a signal at the radar and its display as a "blip" at the ARTC center would be too short to be of consequence. No "fine grain" information is lost. The MRR-3 system would require repeater stations every 25 miles between each search radar and ARTC center. Elimination of the large personnel complements and telephone line rental would bring the installation cost of the broad-bandwidth system below that of the manual, and yearly operating cost to less than 6% that of the manual system.

The system that SC-69 regards as suitable both economically and operationally for immediate application is the Narrow Band system. There are various means of coding or "compressing" data so that narrow band communication

links such as telephone lines can be used to carry data. A number of such systems are held in a security classification, such as one called "Slowed Down Video." The RAFAX narrow band radar relay system produced by Haller, Raymond and Brown, Inc. is a facsimile device that accepts radar video and converts it to a narrow-band signal in the audio range of about 300 to 3,000 cycles per second.

• The transmitted picture is a simple plan position indicator picture on a cathode ray tube with "fine grain" elements missing. However, the presence or absence of targets are indicated. Additional information such as flight number, destination and related information must be transmitted by other means, either by telephone or teletypewriter.

RAFAX uses a photoelectric pickup tube to detect the signal on the screen of a PPI tube at the defense radar site. A mechanical optical scanner "reads



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out" the picture with the phototube just fast enough to detect any significant changes in the signals on the cathode ray tube screen. North marks, range marks and a picture facsimile are transmitted to a remote point by a telephone or radio-telephone channel.

Since bandwidth compression systems permit transmission of radar information over far less expensive facilities than wide-band systems, SC-69 considered a typical RAFAX system in its study. This method has a capacity in excess of the peak load of 134 aircraft every ten seconds, and has an accuracy "exceeding the requirements of the CAA," according to the Committee.

• It is recommended that a single narrow-band system supplemented by one or more voice or control channels, or two or more narrow-bandwidth systems be employed in applications requiring the remoting of more than one plan position display. For remoting of ATC transponder beacon signals, only the manual or broad-bandwidth systems are suitable at present.

Installed cost of the RAFAX system to handle the Boston-Norfolk airway enroute case is less than 10% that of the manual system, and annual cost is less than 1%. In the ultimate case for 1965-1970, SC-69 said remoting methods will depend upon the extent to which it is feasible to utilize air defense system radar data for ATC and upon the air space separations determined practicable with radar control. Improved performance narrow-band systems may then be available.

Since terminal areas require the best practicable resolution of targets on radar displays, SC-69 finds the broad-bandwidth method the only suitable one available. It said for short distance, coaxial cable would be preferable but, where more than a few miles transmission is required, microwave would be a better choice. ♦♦♦

Norris-Thermador Makes Tiny Transformers

J. R. Singleton, general manager of Norris-Thermador Corp.'s electronics division, says sub-miniaturization progress has reduced transformers in size and weight so that they are 1/10th as heavy and 1/20th as large as they were 12 months ago. Norris-Thermador is turning out a transformer for North American Aviation that is thumbnail in size and cannot vary in dimension more than 1/5,000th of an inch.

Formerly encased in metal for protection and moisture-proofing, transformers now are vacuum-resin-laminated. The resin, Singleton said, is "sucked through" the material to draw out all moisture and seal it.

AMERICAN AVIATION

Airline Stocks Selling At Realistic Prices

'Pie-in-Sky' promises of future earnings no longer reflected in current market valuations; greater stability in industry anticipated.

By SELIG ALTSCHUL

Despite a rising earnings trend and sustained investment interest, most airline equities currently show market valuations relatively close to that of their book values. This is revealed in an exclusive AMERICAN AVIATION compilation as presented in Table No. I.

On the whole, these relatively low market-to-book-value ratios disclose that current or near-future earning power is more of a value determinant than ever before. No longer is "pie-in-the-sky," or potential earning power far in the future, accorded liberal price valuations. It shows more restraint in the establishment of investment values for airline equities. In a broad sense, it also reveals that the industry is rapidly approaching an area where greater stability of operations is being anticipated.

This current reading of airline equity valuations takes on added significance in view of the large capital expenditures confronting the air transport industry with the coming of the jet age. As previously indicated (AMERICAN AVIATION, November 7, 1955), \$3 billion in capital expenditures are a reasonable expectation for the industry within the next decade. Of this amount, some \$1-\$1.5 billion in new capital may be required in the form of debt or equity financing.

• Some large pieces of long-term debt financing have recently been completed (Eastern, \$90 million; American, \$75 million; and United, \$120 million). One reason these loans were obtained may be attributed to the strong equity positions of the carriers involved. This again focuses attention on the necessity of having a regulatory climate which will afford the airlines with an opportunity to operate profitably so that they can attract essential equity capital when needed.

Varying degrees of equity financing by separate airlines will be required within the next four or five years. In order to sell new equity issues as well as avoid diluting the interest of present stockholders, it is essential that a market premium over book value be established over a continuing period of time.

It is not enough that a slight market premium over book may occur during abnormal boom market conditions as exist today for many industrial securities.

	No. Common Shares Outstanding (9/30/55)	Market Price Per Share 12/30/55*	Total Market Valuation 12/30/55†	Total Book Valuation 9/30/55	Market/Book Value Ratio
			(000)	(000)	
American	8,645,597*	24	\$207,494	\$114,309	1.82
Braniff	1,842,574	14	25,796	23,156	1.11
Capital	848,358	40	33,934	16,821	2.02
Colonial	520,800	22	11,453	2,289	5.00
Continental ..	590,875	12	7,091	5,397	1.31
Delta	738,038	48	35,425	23,056	1.54
Eastern	2,500,136	51	127,500	65,345	1.95
National	1,025,802	24	24,619	21,155	1.16
Northeast	979,457*	10	9,795	4,928	1.99
Northwest	1,408,598*	19	26,763	28,291	0.95
Pan American ..	6,152,182	18	110,739	121,216	0.91
Trans World ..	3,337,373	25	83,434	72,244	1.15
United	3,242,707	39	126,466	104,378	1.21
Western	740,963	22	16,301	12,280	1.33

NOTES: † All Fractions omitted.
* Assuming full conversion of Preferred.
SOURCES: CAB Recurrent Reports.
Company Reports.

It is the normal experience developed over a period of years that generally controls. During boom periods, like the present, market prices should be substantially higher than book if satisfactory new equity flotations are to be effected.

• This point was succinctly made by Professor James C. Bonbright, the dean of public utility economists, who recently said:

"I do not believe that utility companies can count on their ability to raise adequate amounts of equity capital if investors in utility common stock have nothing better to hope for than the attainment, during periods of prosperity, of market prices approximating the book values of their investments. During such periods there must be an opportunity to enjoy an adequate excess of market value over book value."

Certainly, if this applies to regulated public utilities, where relative stability of operations prevail, it definitely pertains to major trunk airlines with their public interest and national defense responsibilities and where they are exposed to far more business risks than normally confront a regulated public utility.

Prevailing market/book value ratios show wide variations among the separate airlines and are evident in Table No. I. An historical trend of these ratios for ten of the major airlines is

presented in Table No. II. In this instance, representative years are selected, permitting the tracing of the group's changing investment statute at significant periods.

• The highest premium over book is present in the market price of Colonial. In this instance, however, the dominating consideration is the proposed acquisition by Eastern, which keys the market price of Colonial to the terms of exchange, i. e., two shares of Colonial for one share of Eastern.

Capital Airlines enjoys the largest uninhibited market value premium over book with a ratio of 2.02. This not only reflects the remarkable earnings recovery of the company, but anticipates a hopeful outlook by virtue of its Viscount operations, plus attractive new routes. Moreover, considerable leverage is present on the equity in view of the debt financing being employed to acquire the Viscount equipment.

Of the Big Four, Eastern currently appears to enjoy the favored investment rating on the basis of its 1.95 market/book value ratio. In this respect, it appears to have replaced American, which held this distinction in the past. Unquestionably, Eastern's unbroken earnings record extending for 21 consecutive years, plus its ultraconservative accounting policies, are factors in this market judgment.

• One of the most stable and im-

proving market/book value ratios belongs to United Airlines. For example, at the 1955 year-end its 1.21 ratio was higher than the 0.71 ratio averaged in 1949 which was the first convincing recovery year in the postwar period. This is contrary to the longer-term trend prevailing for most of the trunks.

Pan American World Airways is not only currently available in the market place at a discount to book but has shown this characteristic consistently since 1947. This is nothing more than a reflection of the vagaries on earnings exercised by a vacillating government subsidy policy.

TABLE NO. II
Selected Major Airlines Average Market/Book Value Ratios
For Representative Years

	1941	1946	1949	1952	1954	1955*
American	2.79	3.32	2.77	2.23	1.69	1.82
Braniff	1.42	3.30	0.99	1.35	0.95	1.11
Capital	2.21	3.71	3.43	1.13	1.20	2.02
Eastern	1.70	2.81	1.31	1.35	1.30	1.95
National	2.79	5.32	1.17	1.36	0.84	1.16
Northwest	1.39	2.04	0.68	0.83	0.62	0.95
Pan American	1.01	1.43	0.65	0.66	0.83	0.91
TWA	1.72	2.99	1.57	1.18	1.09	1.15
United	1.50	1.86	0.71	1.12	0.98	1.21
Western	1.56	3.80	0.73	1.01	0.87	1.33

NOTES: * At 1955 year-end.

Dear Juney Girl:

Dear Junejy Girls:


Well, here I am creaming along at ten thousand feet, with my automatic pilot — I am sitting back in the cabin in my bathrobe and skull cap, typing out this note enroute to Dutton's Dump International National Airport for the annual moose shoot on Runway 774. The way Southwest Airmotive takes care of me and my flyin' machine, there's nothing much for either of us to do but purr-rrr. Yessir, kitten, we've found a home! And now — after 24 years being Fastest with the Mostest — they're busy spending another Two Million Bucks on a new business airplane terminal that'll top anything of its kind in the world.

I feel

top anything of its kind.

With my life such a Many-Splendered Thing. I feel terrible about the hard time you're having in Bigberg. I worry about you, working all day and half the night tying finger-loops in that Yo-Yo factory, living in that cold water flat at the Y, drinking clabber, sleeping in a flour sack nightie, and such. Enclosed is a check for \$7, half the Christmas bonus my boss, Mr. Moguldough Propwash, gave me for flying 90 hours over my normal 800 last month (789 on instruments — hallelujah again for Southwest Airmotive). I wonder sometimes if he knows how really lucky he is — having me AND Southwest Airmotive. Between the two of us — me and SAC, I mean — old MP's got business flying's surest and safest combination. Ahem.

Say, sweetie — in a town like Bigberg, a girl 21, 5'2", 110 lbs., with brown hair and blue eyes, should beware of scheming men, especially pilots!



Love and Kisses.

Daddy

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In viewing the trends from 1941 to the present for the ten major carriers where public ownership of securities predominated (Table No. II) it is noteworthy that current market/book value ratios contain little, if any, of the inflated hopes which were rampant, for example, in 1946. In that period, peaks for most airline market prices were established and as they projected great hopes for the future, bore little relationship to underlying asset or book values.

An interesting corollary of the current valuations shown in Table No. I is the aggregate market price of more than \$736 million placed on the equities of the thirteen domestic trunks. In 1939, this writer observed that it would have been theoretically possible to purchase the equity interests of the entire domestic air transport industry for less than \$40 million. That would have been a cheap price for control of a fast-growing industry.

• **Captain Eddie Rickenbacker** observed recently that 17 years ago, in December 1938, \$3.5 million purchased all of the assets that made up Eastern. Today the equity interest enjoys a market valuation of around \$127.5 million.

The qualities of growth—and earnings—have been quickly reflected in the market valuations established for equities of the airlines. As long as these factors of growth and earnings are present, their manifestations will continue to appear in burgeoning market valuations. ♦♦♦

New Viscount Service

Viscount service between New York and Bermuda was inaugurated by British Overseas Airways Corp. January 1. The aircraft operate a twice-weekly first-class flight supplementing the daily Super Constellation tourist service.

The Viscounts fly on from Bermuda to Trinidad via San Juan and Barbados under British West Indian Airways schedules. BOAC also operates three Viscount flights daily between Miami and Nassau and a weekly service from Miami to Trinidad via Nassau, Jamaica and Caracas.

Lear's New Blind Flying Gyro, NAFLI, Performs Three Functions

Lear, Inc. is now in early production on its new NAFLI (NATural FLight Instrument) system at the Learcal division in Santa Monica, Calif. First units are undergoing service test in several aircraft, including a Learstar.

Lear describes NAFLI as an entirely new concept and presentation in blind flying instrumentation. It has a three-in-one blind flying gyro instrument that combines in a single presentation the same information ordinarily presented by two larger instruments, the directional gyro and a gyro horizon indicator, plus a third function not found in either of the two.

The NAFLI instrument presentation is optically natural. If the right wing is down and the nose up (above the horizon) this is what the pilot sees in a single pictorial presentation, without having to subconsciously transpose the image he sees. The indicator shows whether the aircraft is (1) diving or climbing, and at what angle; (2) whether it is banking to the right or to the left, and to what degree; and (3) the direction the aircraft is heading as read on an azimuth scale.

• **Lear reports** that pilots with little or no blind flying experience have, after 10 minutes instruction, learned to climb, descend, turn and establish a pre-selected heading without any other visual reference than the NAFLI instrument. The company says fully rated instrument pilots, accustomed to concentrating on two or three instruments at a time, find the NAFLI composite presentation less fatiguing.

Attitude is indicated on the instrument by pointers representing the aircraft in silhouette. One, a side view, indicates pitch (nose up or down) and the other, viewed as looking forward from behind the aircraft, indicates bank (or roll) by the attitude of the wings. The roll pointer and heading card work in unison so that when turning, bank and heading are read together.

The airplane is held in a bank until the desired new heading is read on the gyro operated compass card directly behind the roll pointer. The turn is completed by decreasing the bank, as necessary, to hold the roll pointer and new heading indication super-imposed. The bank becomes zero as the new heading is assumed, resulting, Lear says, in a precisely executed turn.

The triple indicator is complete in a 3 1/8-inch standard instrument case. The pictorial presentation is operated



The Lear, Inc. NAFLI (Natural Flight Instrument), shown in the center, complete in a 3 1/8 inches standard instrument case, combines the functions of the two standard directional and horizon indicators, left and right. It also shows pitch of the aircraft.

by synchros, receiving signals derived from a set of new-type electrically-driven remote directional and vertical gyros having steel rotors, gimbals and frames. Lear says the features of construction solve the problems caused by the differential expansion of dissimilar metals with changes in temperature. Provisions for slaving the directional gyro to the compass have been incorporated in the design of the NAFLI system.

The assembly housing the gyros, with their associated electronic components and the NAFLI system junction box, is a standard 1/2 ATR sized shock-mounted package, weighing approximately 25 pounds. Electronic amplifiers for leveling and slaving are 100%

transistorized and utilize etched wiring.

The control panel for the directional gyro contains a manual control, for initially adjusting to the magnetic heading, when slaving is not employed; the latitude compensation control, and a switch for selection of free or slaved gyro operation. The 2 1/4-inch high panel is edge-lighted, and fits the standard five-inch military-type console rack.

Lear gives these typical performance figures for the NAFLI system: within one degree of level indication during level flight; within 1 1/2 degree of magnetic heading when operated as a slaved gyro-compass; within four degrees per hour drift when operated as a free directional gyro. ♦ ♦ ♦

'BB' Guns Pepper Hot Jet Engine Blades

Materials engineers of the Westinghouse Electric Corp. are using a conventional air-operated "bb" gun to test



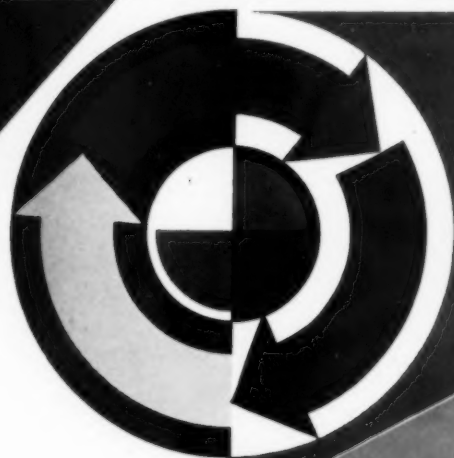
the effect of small foreign particles on compressor and turbine blades in jet engines.

When a jet plane roars down a run-

way, stones and other foreign objects are sometimes sucked into the front end of the engine. While screens over the intake keep out the large objects, small particles get through. At high speeds, they can do a lot of damage.

Here's how the "bb" gun was brought into play. Molybdenum, being considered as a possible material for turbine blades, oxidizes rapidly at 1,500°F. When used for jet engine parts it is coated with a thin layer of non-oxidizing material such as Inconel. If a small stone should strike a blade and crack the coating, the molybdenum would be exposed to oxidation.

To test this possibility, engineers at Westinghouse fire a "bb" gun at a blade sample at operating temperature, thus simulating the effect of small stones. To date, it is said, the Inconel-coated blades are proving tough enough to withstand the simulated stone-throwing.




FOR A COPY OF THIS ALLNER ILLUSTRATION SUITABLE FOR FRAMING, WRITE TO
PUBLIC RELATIONS DEPT. AVCO DEFENSE AND INDUSTRIAL PRODUCTS, STRATFORD, CONN.

ENGINEERS WANTED: For top-flight men, Lycoming offers unusual opportunities to explore new scientific frontiers that lead to outstanding and rewarding careers. Write to Vice President, Engineering, Stratford, Connecticut.

Lycoming

Circle No. 19 on Reader Service Card



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As America goes about her business of flying, building, manufacturing, ploughing, pumping, harvesting—her song is a surging, roaring chorus of power. And, growingly, through this symphony of progress you hear the sure, dependable voice of Lycoming power.

Over the years, engineers and scientists of Avco's Lycoming Division have fashioned an endless array of power plants. *Power* to drive marine craft and autos. *Power* to dominate the nation's helicopter and executive aircraft fleets. *Power* to meet a wide variety of industrial needs.

Today, working to brilliantly foresighted military specifications, Lycoming is adding to its already announced 825-horsepower T-53 gas turbine, a second gas turbine, which delivers substantially greater horsepower. The Lycoming industrial engine family, offering dependable power to construction and agriculture, is being enlarged. Lycoming super-charged engines are driving private aircraft higher and faster than ever. New power sources are being explored by Lycoming scientists. As America's power needs grow, Lycoming science and its vast supporting production facilities are growing to meet them . . . working to *keep America singing*.

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avco defense and industrial products

MANUFACTURING CORPORATION

Avco Defense and Industrial Products combine the scientific and engineering skills, and production facilities of three great divisions of Avco Manufacturing Corp.: Lycoming; Avco Advanced Development; Crosley—to produce power plants, electronics, air-frame components, and precision parts at installations located as follows: Boston, Mass.; Cincinnati, Ohio; Dayton, Ohio; Everett, Mass.; Los Angeles, Calif.; Nashville, Tenn.; Richmond, Ind.; Stratford, Conn.; Washington, D. C.; Williamsport, Pa.

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Helping provide global survival for SAC Voodoo pilots...

**Weber ejection seats combine
split-second safety with
long-range comfort... light weight.**

Sub-tropic... to arctic cold... regardless of the climate or terrain, pilots of McDonnell's F-101A supersonic, long-range strategic fighter have *safety* at their finger tips.

Safety in the air because the Weber ejection seat provides split-second escape. Safety on the ground or sea because each seat makes provision for a global survival kit... with its complete range of all-weather emergency equipment and rations.

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Weber ejection seats are now in use on many of our leading fighters, interceptors, bombers, trainers. Weber advanced research is pursuing completely new concepts in pilot and crew escape. If you have an escape problem, a Weber engineering team can help you solve it.

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Creative engineers, desiring to express themselves on advanced aircraft projects with a growing company, contact John Turner, Chief Engineer.



WEBER AIRCRAFT CORPORATION

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Circle No. 20 on Reader Service Card.

Ralph Damon Dies

U.S. aviation this month suffered a severe loss with the sudden death January 4 of Ralph S. Damon, president of Trans World Airlines. Damon, who was 58, succumbed to pneumonia after a short illness.

At the time of his death Damon was approaching his seventh anniversary as TWA president, having joined the airline in January 1949. Previously he had been president of American Airlines, of Republic Aviation Corp. and of Curtiss Aeroplane and Motor Co.



Damon entered aviation in 1918 as a flying cadet in the U.S. Army Air Corps and has been associated with some phase of the industry since that time. In 1922 he joined Curtiss Aeroplane and Motor Co. and rose from factory superintendent to president in the succeeding 13 years.

Damon's entry into the air transport field came in 1936 when he joined American Airlines as v.p.-operations. After a World War II government assignment as president of Republic, he rejoined American in 1943 and became president in 1945.



★W. J. Skory, Chance Vought Aircraft, Inc. Experimental service mechanic and lead man, Dallas, Tex. (30 yrs.)

Thomas F. Niland, Pratt & Whitney Co. Production control, West Hartford, Conn.

Donald MacDonald, Pratt & Whitney Aircraft. Engine lathe operator, East Hartford, Conn.

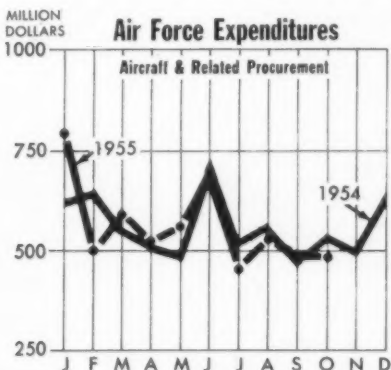
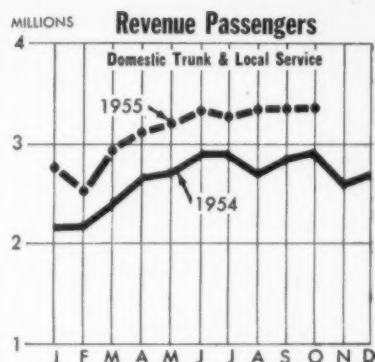
William Turkington, Pratt & Whitney Aircraft. Carpenter, East Hartford, Conn.

Clifford O. Kemp, Pratt & Whitney Aircraft. Foreman, East Hartford, Conn.

Leroy Sheldon, Pratt & Whitney Aircraft. Asst. supt., East Hartford, Conn.

JANUARY 16, 1956

Pulse Of The Industry





as we see it...

An airline ticket is a seat to somewhere. In it, passengers make a direct contact with the comfort and service you offer. Seats, then, must win passenger approval from the first moment!

That's why we feel airline seats are important enough to deserve nothing less than the *full-time* specialized research, design and production efforts only TECO provides!

Teco, and Teco people (you'll meet several in future ads) take pride in being dependent on building *only* airline seats. It's the best incentive for building them best — and your assurance of satisfaction!

Gordon L. Jones
PRESIDENT

TECO INC.

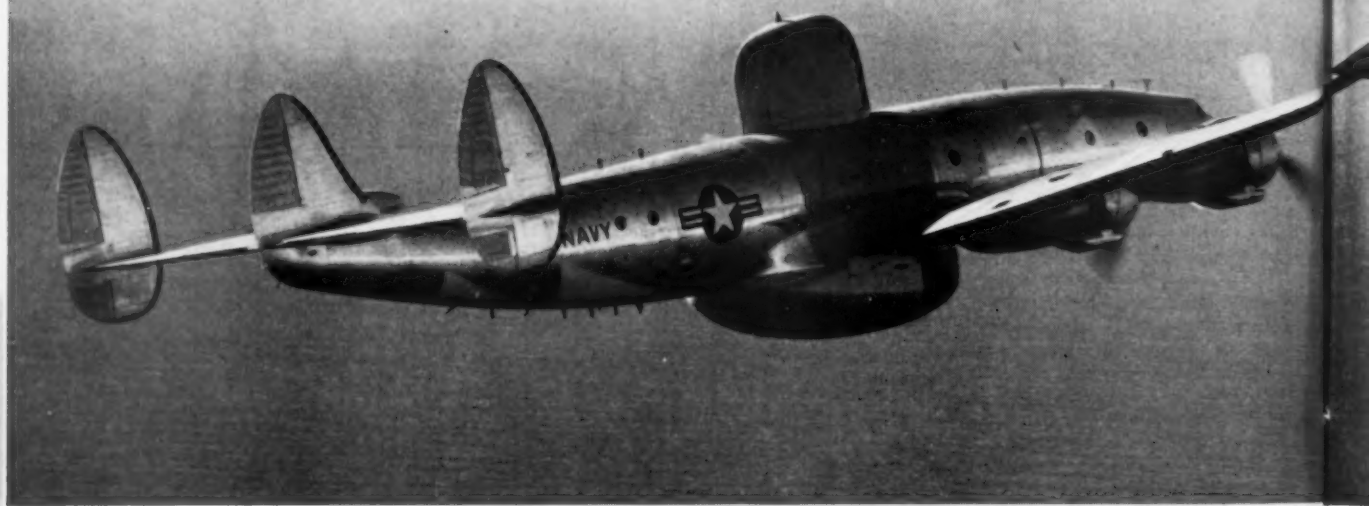
3210 WINONA AVENUE • BURBANK, CALIFORNIA

IN CANADA: Railway & Power Engineering Corp., Ltd., Montreal • MIDWEST & SEATTLE: George E. Harris & Co., Wichita

Circle No. 17 on Reader Service Card.

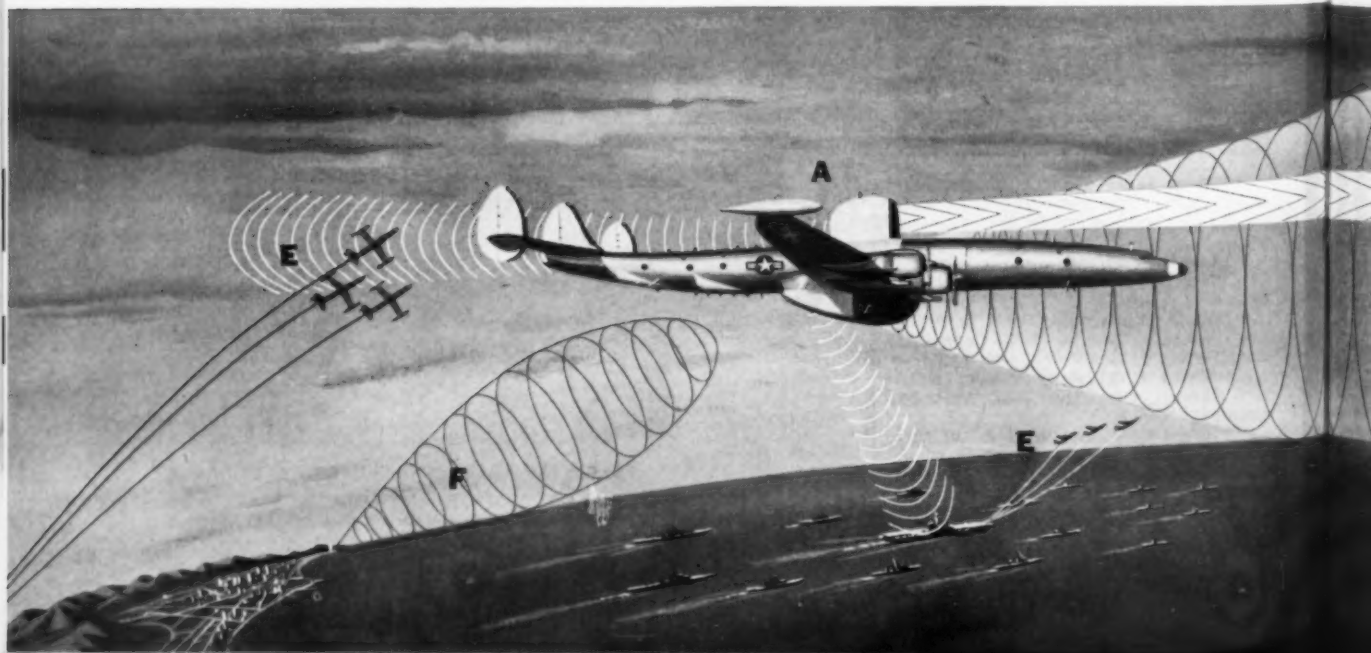
New U.S. Concept for TOTAL DEFENSE

In this age of awesome airborne nuclear weapons, a vast umbrella of airborne electronics will safeguard our nation against sneak attack



BELOW—A WEAPONS SYSTEM IN ACTION. An electronics-laden Super Constellation early-warning plane (A), patrolling our outermost defense perimeter hundreds of miles from our shores and borders, from its high altitude can "see" beyond the horizon and detect both

high-flying and low-flying enemy aircraft (B). Using its powerful search radar (C) and height-finder radar beam (D) to pinpoint position of invaders, the patrol plane alerts our interceptors (E), which swarm aloft and are radar-guided through fog or darkness to intercept and



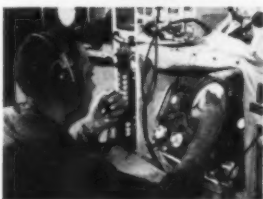
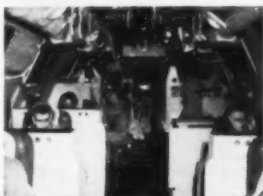


LEFT—EARLY-WARNING RADAR PATROL. Designated the WV-2 by U.S. Navy and EC-121 by USAF, these radar-domed Lockheed Super Constellations carry six tons of electronics and a 31-man crew. Super Constellations are ideal for this duty because of their famed all-weather stability and extremely long range.

ABOVE—ROCKET-FIRING STARFIRE INTERCEPTOR. First of the almost-automatic all-weather interceptors, the Lockheed F-94C Starfire is an example of Lockheed's leadership in the design and development of airborne electronics. This deadly defender and other interceptors will soon be supplemented by—

Farsighted Pentagon planning and recent amazing technological developments by U.S. science and industry are rapidly making our nation's **TOTAL DEFENSE** system the most formidable in all history.

Lockheed's role in implementing our new Weapons System concept and in Systems management, is an important one. Thousands of Lockheed military aircraft, of nine widely different types, are already in service. Other advanced planes, missiles and electronic guidance devices are in production, undergoing tests or on the drawing boards at Lockheed. And Lockheed's pioneering leadership in design and development of airborne electronics will continue to contribute heavily to **TOTAL DEFENSE**.



STILL-SECRET F-104 SUPERSONIC JET FIGHTER. (Photo not yet released.) A high-ranking USAF officer said of the F-104: "This is a fighter pilot's dream. We feel confident that it is the fastest, highest-flying fighter in the air, anywhere."

THREE PHOTOS AT LEFT show crew members of Super Constellation early-warning plane at work. (Top) Navigator plotting a fix; (center) observers at radar consoles plotting altitude, speed and course of unidentified aircraft; (bottom) fighter-director charting position and path of approaching aircraft.

Lockheed

AIRCRAFT CORPORATION

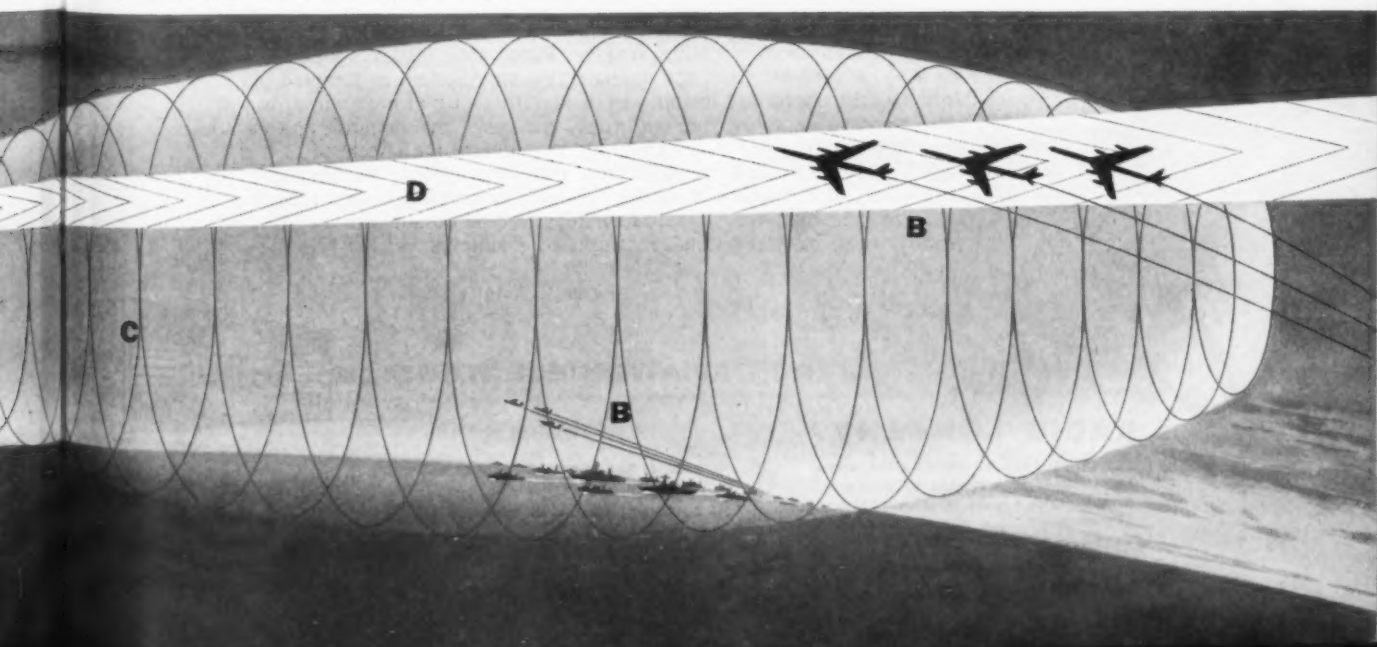
California Division, Burbank, Calif.
Georgia Division, Marietta, Ga.
Missile Systems Division, Van Nuys, Calif.
Lockheed Air Terminal, Burbank, Calif.
Lockheed Aircraft Service, Burbank, Calif.

LOOK TO LOCKHEED FOR LEADERSHIP

A CAREER IN MILITARY AVIATION ASSURES A FINE FUTURE FOR YOUNG MEN OVER 17. SEE YOUR NAVY OR AIR FORCE RECRUITING OFFICER.

powerful
position
warn
et and

destroy the attackers with high-speed rockets or missiles. Any enemy aircraft penetrating our barrier patrol areas would be detected by shore-based radar stations (F) and Ground Observer Corps outposts continuously manned by patriotic civilians helping to keep our nation free.





WEATHER RADAR with *Collins* RELIABILITY

Now taking its rightful place in the most highly-reliable line of airborne electronic equipment is Collins Weather Penetrating Radar System, the WP-101. Lightweight and compact, the new System is designed to Arinc specifications and includes in its features: (1) Printed wiring to cut weight and space, to provide uniformity and easier maintenance and to improve reliability (2) A load isolator to minimize the effects of high VSWR with long wave guide runs, thus assuring long life for the magnetron (3) Magnetic amplifier-regulated power supplies to reduce tube requirements, and (4) Modular plug-in type design with readily-accessible test points for simplified maintenance.

Write for Collins WP-101 brochure.

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1200 18th Street N.W., WASHINGTON, D.C.

COLLINS RADIO COMPANY OF CANADA, LTD.
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COLLINS RADIO CO. OF ENGLAND, LTD.
Sunflex Works, Colham Mill Road
West Drayton, MIDDLESEX, ENGLAND



CLEAN VALVES AND PISTONS in Seconds!



NEW!

Kleerflo
HANDI-MASTER
Patent Pending
Model HM 500



NEW!

Kleerflo
PISTONMASTER
Patented
Model PM 400



Valve cleaning time has been reduced to a new record time of ten seconds by the Kleer-Flo HANDI-MASTER that can also be easily converted to do a host of other important shop jobs.

The valve up to a 1/2" stem is locked into place in the chuck of the unit and is rotated rapidly by a 1/3 H.P. motor. A series of ingenious metal, spring-mounted cutters and scrapers then contact the valve to remove deposits from all surfaces, including those valves that have depressed crowns. No air compressor, cleaning device, or other power source is required.

The portable Kleer-Flo HANDI-MASTER can be wheeled anywhere in the shop and can be converted for many other shop uses such as a horizontal drill press or as a remote controlled sander, buffer, grinder or drill.

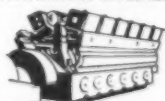
The time-consuming hand and abrasive methods of piston cleaning are now obsolete with the fast and thorough Kleer-Flo PISTONMASTER that will gently clean any piston now on the market or foreseen.

The Kleer-Flo PISTONMASTER releases skilled labor from a lengthy, tiresome and difficult chore, doing a more thorough and precise job in seconds than formerly was possible in hours.

A continuous flowing liquid solvent aids the cleaning action of the brushes in the unit. After reassembly, no sand or abrasive is present to endanger scoring cylinder walls and bearings.

A PISTONMASTER belongs in every service shop to drastically cut cleaning costs and add to profits.

MARINE AND
STATIONARY ENGINES



CYCLES



AUTOMOBILES



MOTOR TRUCKS



DIESEL TRUCKS



AIRCRAFT



CLEANS ALL VALVES AND PISTONS USED ON THE GROUND AND IN THE AIR!

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America's Foremost Producer
of Parts Cleaning Equipment

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AEROTHERM

AIRCRAFT SEATS



A section of a typical Aerotherm Spare Parts and Service Manual

Reduce

Maintenance with Interchangeable Parts

Uniformity of parts simplifies inventory and cuts maintenance costs.

Production tooling, stocked for future needs, assures interchangeability of replaceable parts for any Aerotherm seat.

Inventory reduction equals reduction of investment. Why not contact our Project Engineers on your seating problem?

Project Engineers:

THE THERMIX CORPORATION
GREENWICH, CONN.

THERMIX CALIFORNIA, INC., 5333 Sepulveda Blvd., Culver City, Calif.
Canadian Affiliates: T. C. CHOWN, LTD., Montreal 25, Quebec

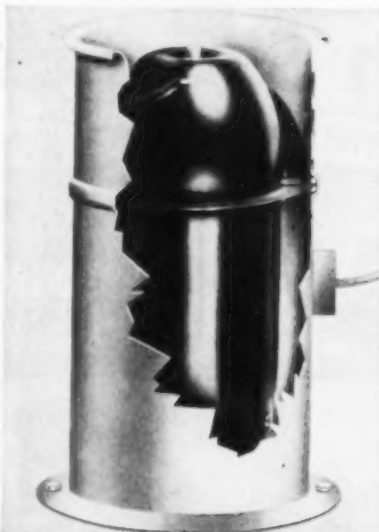
MANUFACTURERS:

THE AEROTHERM CORPORATION
BANTAM, CONN.

Circle No. 26 on Reader Service Card.

New Products and Processes

SHUT-OFF BLOWER



A shut-off blower, a combination fan and valve that ventilates and seals automatically, has been developed by Lundy Manufacturing Corp.

The automatic sealing feature is of special utility in aircraft applications, such as ground blowers and radar compartment cooling.

Spring-loaded iris-type fins automatically seal the ventilator when power is turned off. Since only one motor is required for the ventilation and sealing cycle, the Lundy blower is said to have a weight advantage over similar fan designs. It is available in two models: A398, which delivers 70 cfm at 5 in. of water and A447, which delivers 600 cfm at 8 in. of water.

Circle No. 168 on Reader Service Card.

TANK-UNIT TESTER



Avien, Inc. has developed a portable field and shop tester for checking calibration accuracy and insulation of fuel gauge tank units.

Designated Model 1617-040, the tester corresponds to military type MD-2 and conforms to all requirements of

specification MIL-T-4687A. The maker says it may be used for all capacitance type tank units regardless of manufacturer or aircraft application.

The tester measures tank unit capacitance directly without use of correction cards or interpolations. It has provisions for measuring insulation resistance of tank units, either through fuel gauge cables or by means of external test leads.

Circle No. 161 on Reader Service Card.

SELF-SEALING DISCONNECT



A self-sealing, straight-through disconnect for fuel and oil lines is offered by Eastern Aircraft Products Corp.

This coupling instantaneously converts any connection into a straight-through line, according to the manufacturer. Pressure drop is kept to a minimum, equivalent to that of a straight tubing section. Positive locking action insures safety of the connection under severe vibration.

Only one-eighth turn is required to disconnect or connect with system pressures up to 200 psi. The unit is made in a variety of sizes to fit fuel and oil lines on aircraft, guided missiles, test stands and ground handling equipment.

Circle No. 162 on Reader Service Card.

COMPARISON BRIDGE

A Model 260 bridge for comparing the magnitude and phase differences of resistive, capacitive and inductive components has been developed by Electro-Measurements, Inc. for use where matching to 0.01 percent is required.

Three ranges for magnitude are provided with scales of plus or minus 0.3, 3 and 30%. Phase deviation ranges are plus or minus 0.15, 1.5 and 15%. The resistance range measures to 20 megohms. Plug-in networks are available for any frequency of operation between 100 cycles and 10 kc.

The instrument stand is adjustable for tilt, and the wrought iron leg supports may be folded back for shelf storage. The bridge operates from 105-

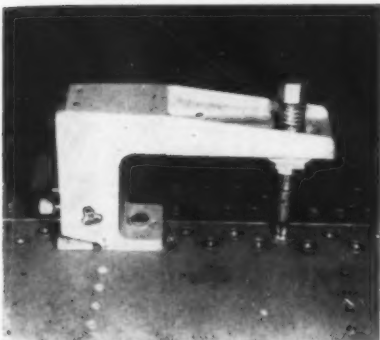
AMERICAN AVIATION

NEW PRODUCTS

125 volt 50 to 60-cycle sources. Weight is under 22 lbs. The unit measures 13 x 9 x 7 in.

Circle No. 170 on Reader Service Card.

SCREW EXTRACTOR



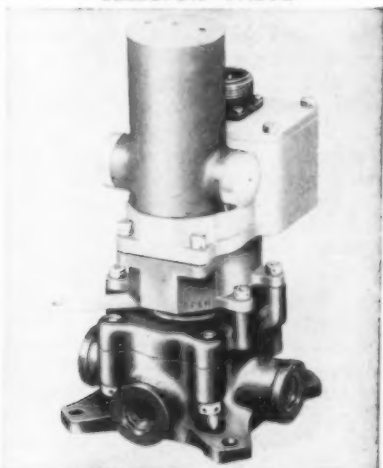
Deejl Pacific Co. offers a screw extractor, developed by Northrop Aircraft, Inc., to help remove recessed-head screws that have stripped slots, frozen threads or are otherwise difficult to remove with standard tools.

As shown here, the extractor is set up and ready to remove such a screw. It is held in position by a single bolt screwed into nutplate of a previously removed screw. The knurled adjustment knob at the base of the extractor is used when the tool is bolted to a convex or concave surface.

To remove the screw a $\frac{3}{4}$ -in. wrench is used to turn the stud assembly. This in turn twists the bit to back out the screw.

Circle No. 163 on Reader Service Card.

SELECTOR VALVE



General Controls Co. is producing a motor-operated aircraft selector valve for high-temperature hydraulic systems.

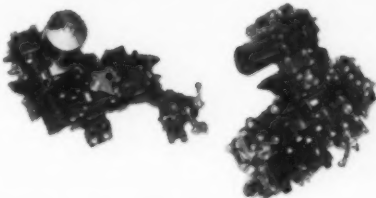
A new addition to the company's Series AV-14A valves, this unit can change position in half a second at -65°F and remains in either position
(Continued on page 60)

Circle No. 24 on Reader Service Card.

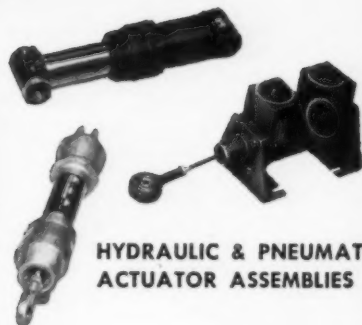
XLO

EX-CELL-O PRECISION

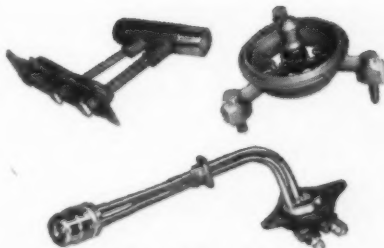
Ex-Cell-O Precision at Production Prices



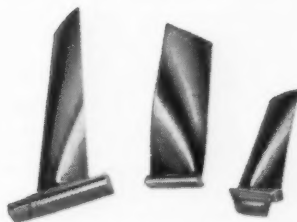
FUEL CONTROL AND
METERING ASSEMBLIES



HYDRAULIC & PNEUMATIC
ACTUATOR ASSEMBLIES



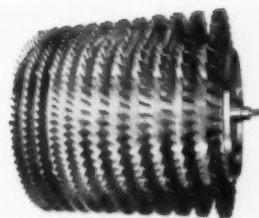
FUEL NOZZLES FOR
JET ENGINES



JET ENGINE BLADES



MISCELLANEOUS AIRCRAFT AND
COMMERCIAL PRECISION PARTS



JET COMPRESSOR ROTORS

Ex-Cell-O's facilities include laboratory control of materials, design and process engineering, machining of all materials, complete quality control to meet the most rigid specifications, and delivery to meet customers' requirements.

For information or a quotation, write or phone the Precision Products Division of Ex-Cell-O.

54-23

EX-CELL-O CORPORATION • DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

NEW PRODUCTS

(Continued from page 59)

without electrical power consumption. Its operation is independent from pressure in the hydraulic system.

The brief period during which the electric motor operates to change position makes the valve particularly suitable for high ambient and high fluid temperatures, according to the manufacturer.

Circle No. 167 on Reader Service Card.

DECAL KITS

Aircraft Marking Co. is offering decal kits containing complete interior and exterior marking requirements for an aircraft. The service is designed primarily for large government and civilian overhaul facilities.

Each kit is packaged by area—"Center Cockpit," "Control Pedestal," etc.—to simplify installation. Marking prints, indicating placement of exterior markings, aid in installation. Check lists including all markings by area assure compliance with regulations. The company describes its marking service as effecting substantial savings in engineering and purchasing, since one simple purchase order specifying a quantity of complete marking kits for any given aircraft eliminates the need of assign-

ing part numbers and individual purchase orders for hundreds of markings required for each aircraft.

Circle No. 169 on Reader Service Card.

TOGGLE SWITCH



Mason Electric Corp. has announced a heavy-duty toggle switch for use on radar scanners, aircraft auxiliary trim systems, ground fire control and industrial uses. It is described as a momentary-contact, four-throw, single-pole, center-off unit, with a snap feel.

Designated the 5050 Series, the switch is internally sealed with a silicone boot that keeps moisture and dust away from the contacts. It is said to eliminate the need for relays because it operates

actuator motors directly. It breaks inductive loads at high altitudes and has excellent vibration and shock characteristics.

Circle No. 165 on Reader Service Card.

REFUELING UNIT

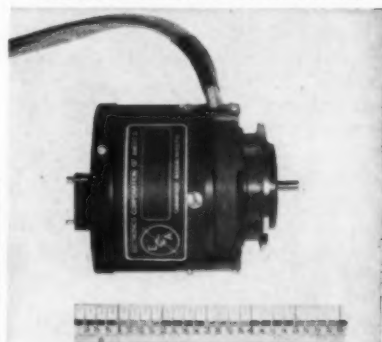
A high-capacity refueling unit for the probe and drogue system developed by Flight Refueling, Inc. is said to have a rate of flow several times that of the type now in production.

Designated the A-16, the unit was developed to meet requirements of the new jet tankers to be used for refueling high-speed jet bombers and fighters. Having been ground-tested under simulated flight conditions, it is expected to be flight-tested at the Wright Air Development Center soon.

Flight operation of the Model A-16 is performed in the same manner as the Model A-12 unit being produced by the same company for the Air Force and the Navy.

Circle No. 160 on Reader Service Card.

ANALOG-DIGITAL CONVERTER



A compact, direct-reading, shaft position analog-digital encoder has been developed by the Electronics Corp. of America. For instrumentation in the fields of missile guidance, radar tracking and other fields where there is need to determine the position of a shaft with speed and accuracy, the converter uses a cyclical-binary code expressed as clear and opaque areas in concentric rings printed photographically on a glass disk.

Flashing radiation from a gas-discharge lamp is transmitted through the glass disk. The radiation causes voltage pulses, used as binary "1's", to be generated by the elements of a multi-element photo-cell on which the light falls. "No-signal" areas of the disk represent a binary "0".

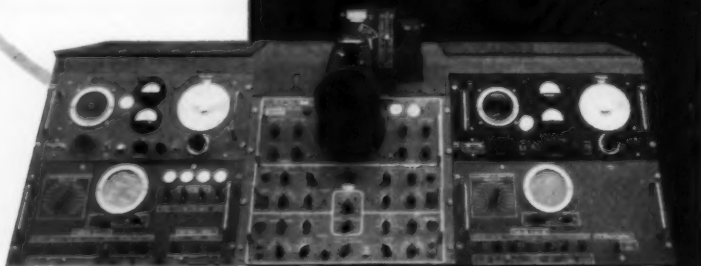
Shaft position accuracy of 1 part in 8192 is obtainable, according to the manufacturer. The standard unit has 13 channels. Output is 1½ to 3 volts from potted, transistorized preamplifiers built into the unit.

Circle No. 157 on Reader Service Card.

(Continued on page 63)

NEMS-CLARKE Special Purpose Receivers are designed for optimum performance in telemetering, guided-missile monitoring and radio-sonde reception and many other applications calling for superior performance. These Receivers are now in use by most of the leading aircraft companies.

CONVAIR SPECIFIES NEMS-CLARKE ALL-PURPOSE RECEIVERS



Above photo shows portion of telemeter ground station test unit of Convair's Guided Missile Plant in Pomona, Cal., using the NEMS-CLARKE Receiver.

For further details
Write Dept. B-1

NEMS-
CLARKE
Incorporated

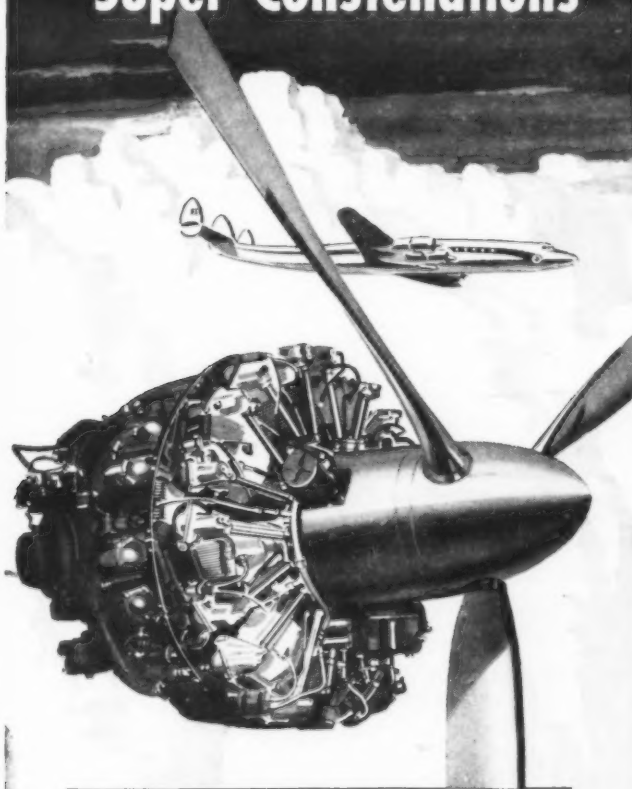
PRECISION ELECTRONIC INSTRUMENTS
SILVER SPRING, MARYLAND

Circle No. 25 on Reader Service Card.

CURTISS-WRIGHT

engine-propeller team
powers

AIR FRANCE'S New Lockheed Super Constellations



ENGINEERS • TECHNICIANS • SCIENTISTS

Curtiss-Wright has permanent career positions open for specialists in advanced engines and propellers, metallurgy, electronics, nucleonics, ultrasonics, plastics and chemistry. New 85-square-mile Research and Development Center at Quehanna, Pennsylvania and expanded divisional engineering programs are creating opportunities for more engineers, technicians and scientists in both aviation and diversified industrial projects. . . . Write to: Engineering Placement Department, Curtiss-Wright Corporation, Wood-Ridge, New Jersey.



ELECTRIC PROPELLERS Provide Maximum Flight Efficiency in Combination with World-Famous TURBO COMPOUND Engines

Air France's international passengers are accustomed to speed and comfort. Early next year they will have more of both, when the airline takes delivery of its faster, more luxurious new Lockheed 1649 Super Constellations, powered by Curtiss-Wright Turbo Compound engines with Curtiss-Wright Electric Propellers.

A total of 34 of the world's leading airlines have selected Turbo Compound power. A growing number of them are teaming the Turbo Compound with Curtiss-Wright Electric Propellers. Featuring positive electric pitch change for complete engine control and closer synchronization, these propellers provide commercial airliners with smoother, quieter operation . . . increased fuel economy. Abrasion and corrosion-resistant extruded steel blades, and single piece forged steel hubs, provide greater dependability, better resistance to impact damage, longer propeller life. And Curtiss-Wright Electric Propellers have reserves for the larger aircraft and greater engine powers that lie ahead.



CURTISS-WRIGHT

CORPORATION • WOOD-RIDGE, N. J.

Now....

NON-CITIZEN ENGINEERS and DESIGNERS

can hold important positions at
REPUBLIC AVIATION

Talented engineers or designers? With experience in Aircraft or Guided Missiles? — BUT NOT CITIZENS OF THE UNITED STATES?

Now you can work at your profession at Republic Aviation!

A special, new, liberal arrangement has been worked out for you by this leading American aircraft company.

If you have had 5 or more years experience in AERONAUTICAL ENGINEERING and DESIGN—emphasizing one or more of the following fields, Republic may have important work for you in:

**AERODYNAMICS
DYNAMICS
FLIGHT TEST
THERMODYNAMICS
FLUTTER & VIBRATIONS
STRESS**

**WEIGHTS
AIRCRAFT & MISSILE DESIGN
PRELIMINARY DESIGN
ELECTRONICS
CONTROLS
SYSTEMS**

*If you wish to join
the select group of
Republic engineers, no
matter where you are
located now, write
promptly, describing your
experience and training
in detail. A convenient
interview can be arranged
in your vicinity.*



Today Republic's famous Thunderjets and Thunderstreaks are in service throughout the free world. These planes, as well as the new RF-84F Thunderflash, form part of the striking arm of the air forces of the U. S. and other NATO countries. Soon to appear are the F-103 and F-105, while planes embodying advanced aerodynamic concepts are already in the mock-up and prototype stage. Still others are on Republic's drafting tables.

AND TO WORK FOR REPUBLIC IS TO LIVE ON LONG ISLAND! You'll enjoy living in the playground of the East Coast, with its fine suburban communities, modern highways, miles of beaches and many state parks.

RELOCATION EXPENSES PAID...LIBERAL BENEFITS. Republic relieves you and your family of all financial worries connected with moving to a new position on Long Island. The company also pays life, health and accident insurance—up to \$20,000—for you, plus hospital-surgical benefits for the whole family, and $\frac{2}{3}$ the cost of your collegiate and graduate studies.

Address: Mr. R. L. Bortner, Assistant Chief Engineer

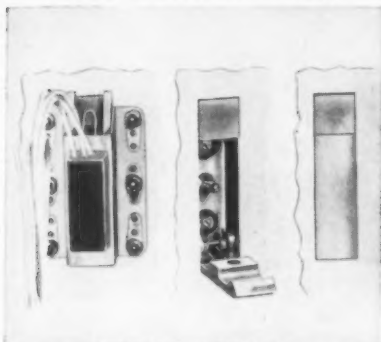
REPUBLIC AVIATION

FARMINGDALE, LONG ISLAND, NEW YORK

NEW PRODUCTS

(Continued from page 60)

TOGGLE SWITCH COVER



Hartwell Aviation Supply Co. is producing flush toggle switch covers designed to provide easy access to toggle switches that must be submerged and protected from the exterior of aircraft or other handling equipment.

Part numbers are H34 for plate-mounted models, H35 for bracket-mounted models. Flush trigger and cover are available in a wide range of offsets to fit a variety of panel thicknesses. A press on the trigger releases the cover to open position and a press on the cover latches it in closed position.

The switch covers are also useful on electrical or electronic equipment, according to the manufacturer.

Circle No. 164 on Reader Service Card.

PRESSURE INDICATOR



A pressure indicator developed in Switzerland and offered in the U. S. by the Kistler Instrument Co. features a quartz crystal transducer and a patented "composite" diaphragm.

The SLM pressure indicator is said to offer many advantages over conventional strain gauge, capacitance and inductive-type pressure pickups and other crystal-type pressure transducers. In recent tests of rocket motors and experimental engines the unit repeatedly survived without damage rough starts and explosions that destroyed other parts of the engines.

In the SLM indicator, a soft, corrugated Inconel ring seals off the com-

(Continued on page 66)

Bendix-Friez AEROVANE* SYSTEM



TRANSMITTER



RECORDER



INDICATOR



CONTROLLER (Windtroll)

...for measuring
wind speed and
direction

Here's a wind measuring system of high accuracy for airport, research and testing use. Indicates and records wind speed and direction. Keeps a permanent log of weather conditions. Used by manufacturers for testing operations in which noise or smoke are involved. Controller actuates operating equipment, signals and alarms.

The Bendix-Friez* Aerovane System is available as a complete package. Or, the individual units may be purchased for use with the transmitter.

TRANSMITTER—Detects wind speed and direction. Electrically sends information to indicator, recorder and controller.

RECORDER—Inks the wind speed and direction on time calibrated chart. Has three speeds for 1½-, 3- or 6-inches per hour. Under normal 3-inch-per-hour setting, recorder operates continuously for two-week period.

INDICATOR—Shows wind speed and direction. Illuminated dials, white over black markings for maximum legibility. Calibrated in degrees of compass and miles per hour.

CONTROLLER—Actuates circuits, turns on alarm system, operates other equipment when wind speed and direction reach pre-determined settings. Wind speed and wind direction dials mounted on face. Automatic time delay device compensates for fluctuating wind direction and speed. Time length is adjustable.

Write today for complete information.

*Reg. U. S. Pat. Off. †Trade-mark

Bendix-Friez

FRIEZ INSTRUMENT DIVISION • BENDIX AVIATION CORPORATION
1476 TAYLOR AVENUE BALTIMORE 4, MARYLAND

Export Sales and Service: Bendix International Division, 205 E. 42nd Street, New York 17, N. Y., U.S.A.

Circle No. 23 on Reader Service Card.



Allison Turbines power new Piasecki "Transporter"

The world's largest turbine-powered transport helicopter, the 40-passenger Piasecki YH-16A "Turbo-Transporter" is powered by two Allison T38 engines driving its giant rotors. These two T38 engines, capable of a total of 5300 shaft horsepower, give the 16-ton "Turbo-Transporter" a speed of approximately 150 mph.

Two Allison T56 engines, capable of a total of 6900 shaft horsepower, will be used in the larger, more powerful production version of the "Turbo-Transporter," the YH-16B, which will carry a

greater payload, or 69 passengers, at a higher speed.

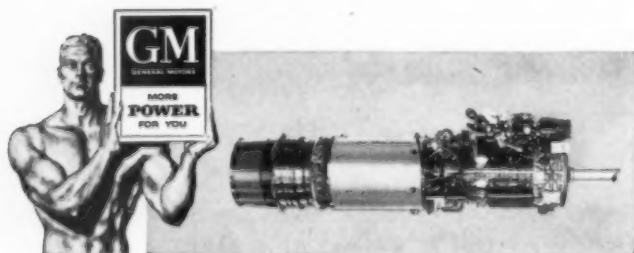
Besides being smaller and lighter than piston engines of comparable power, which allows the helicopter to carry more passengers or cargo, gas turbine engines offer several other advantages: they need no extensive ground warm-up, are easier to service and maintain, and provide greater comfort for passengers and crew.

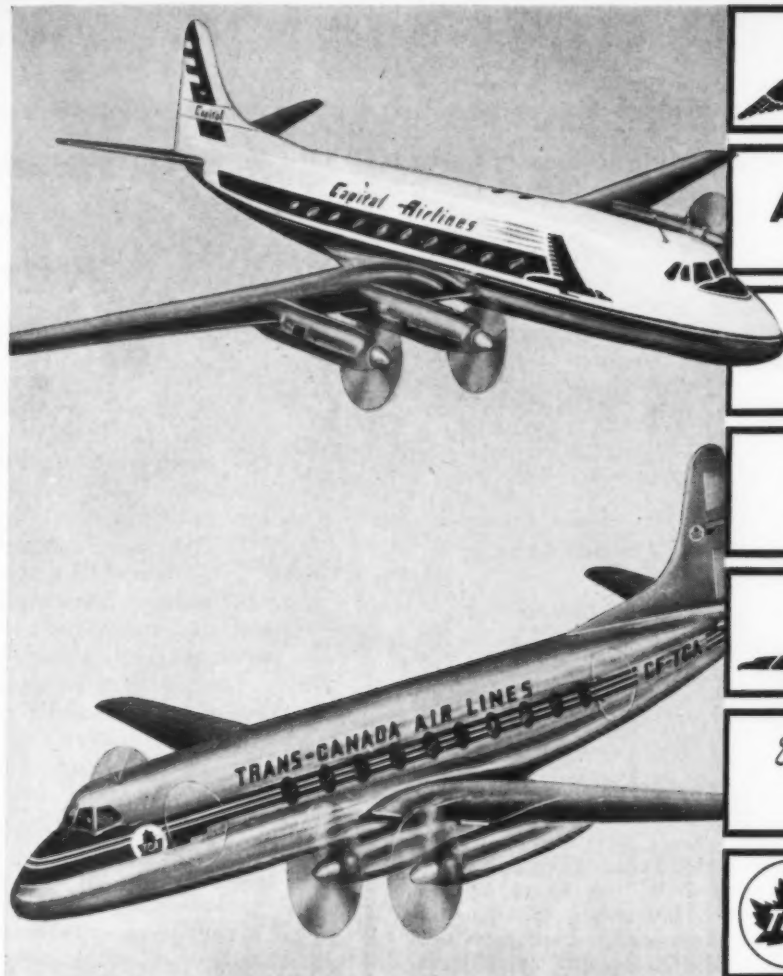
Improved Fuel Economy

With helicopters demanding high power for take-off and hovering for extensive

periods of time, the turbine engine operates at its optimum efficiency. With the added advantage of the turbine engine using cheaper fuel, the over-all fuel economy is better than its piston-powered counterpart.

The new era in American air travel offers increasing opportunities for helicopters, and powerful, compact Allison engines ideally meet the requirements of this service. They are backed by more than seven million hours of turbine engine flight time—*experience where it counts most—in the air!*





SAFE FLIGHT LIFT INSTRUMENTATION STANDARD ON **VISCOUNT** SERVING LEADING NATIONAL & INTERNATIONAL AIRLINES

SAFE FLIGHT stall warning equipment is prominently important on these turbo-prop planes. SAFE FLIGHT has also engineered a valuable Speed Control instrument system—available for all aircraft—providing the flight crew with con-

tinuous wing lift ratio data. A panel-mounted indicator offers the pilot an accurate reading to maintain stable flight...especially significant for turbo-jet aircraft at the high lift coefficients encountered in take-offs, approaches and landings.



SAFE FLIGHT INSTRUMENT CORPORATION

WHITE PLAINS, NEW YORK

"Pioneers in Lift Instrumentation"

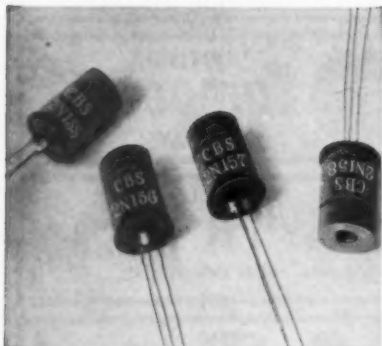
NEW PRODUCTS

(Continued on page 63)

bustion gases while the pressure itself is resisted by tiny wedge-shaped steel pieces that bridge the gap between the housing and inner element and support the soft diaphragm.

Circle No. 166 on Reader Service Card.

POWER TRANSISTORS

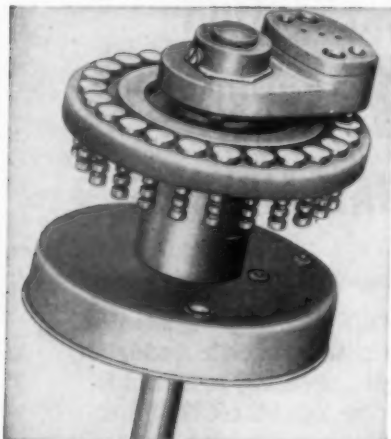


A new series of power transistors has been developed by CBS-Hytron division of Columbia Broadcasting System, Inc. For use in audio, servo amplifier, power converter and low-speed switching circuit applications, the transistors are available in four types; 2N155, 2N156, 2N157, 2N158.

The P-N-P germanium alloy junction transistors feature efficient heat dissipation by use of a copper base that is bolted to the chassis to allow heat flow from the transistor to the chassis. A pair of 2N156 units can furnish 8.5 watts of audio power output with less than 85 milliwatts of driving power.

Circle No. 158 on Reader Service Card.

ROTARY STEP-SWITCHES



A new turret-type contact for use on their rotary step-type switches has been announced by The Daven Co. It is a one-piece combination contact-and-turret lug made of solid silver alloy, gold-plated to provide corrosion resistance and facilitate soldering.

The unit is made with several

notches to hold wire mechanically as well as electrically. Daven recommends the switches for guided-missile control stations, and aircraft and airborne fire-control systems.

Circle No. 159 on Reader Service Card.

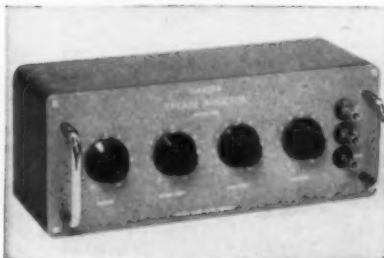
MERCURY VAPOR RECTIFIER

Amperex Electronic Corp. has announced a new mercury vapor grid-controlled rectifier, Type 6786. The tube is rated for a peak inverse voltage of 15 kv and an average plate current of 10 amperes.

The tube was designed for high current power supplies in radio transmitters and industrial rf generators. Under normal ambient temperature conditions, no forced-air cooling is necessary. The tube has a plate-type mounting support base and insulated flexible leads.

Circle No. 171 on Reader Service Card.

DECADE INDUCTOR



A newly developed instrument, Model 1210 Decade Inductor, has been announced by the Shasta Division, Beckman Instruments, Inc. The unit provides inductance values from 0.001 henries to 11.11 henries in 0.001 henry steps to an rated accuracy of ± 1 percent. The unit was designed for use in wave filters, tuned circuits and equalizers for audio and supersonic frequencies.

Effects of magnetic fields are said to be practically eliminated by use of toroidal construction. Electrostatic shielding is provided by aluminum covers.

Circle No. 152 on Reader Service Card.

SEALANT GUN

A sealant gun with disposable cartridges and nozzles molded of Tenite polyethylene is assembled and distributed by Pyles Industries, Inc. It is designed to speed sealing operations in aircraft and other assembly work.

Cartridges containing caulking compound fit into the gun barrel. Threaded nozzles, available in a variety of sizes and shapes, screw into the front end of the cartridges. Air pressure is turned on by a press of the trigger, causing the sealant to extrude smoothly and automatically. When the supply of sealant is used up, or the job finished, the polyethylene parts can be discarded.

The gun is said to be particularly effective at close-quarters work.

Circle No. 172 on Reader Service Card.

To the ENGINEER of high ability

AiResearch is looking for your kind of engineer. Through the efforts of engineers like yourself our company has become a leader in many outstanding aircraft accessory fields. Among them are: air-conditioning and pressurization, heat transfer, pneumatic valves and controls, electric and electronic controls, and the rapidly expanding field of small turbomachinery. AiResearch is also applying this engineering skill to the vitally important missile accessory field.

Our engineers work on the very frontiers of present day scientific knowledge. We need your creative talents and offer you the opportunity to progress

by making full use of your scientific ability.

Positions are now open for aerodynamicists...mechanical

engineers...physicists...

specialists in engineering

mechanics...electrical engineers

...electronics engineers.

For further information write today to Mr. Wayne Clifford,

THE GARRETT CORPORATION

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Los Angeles 45, California.

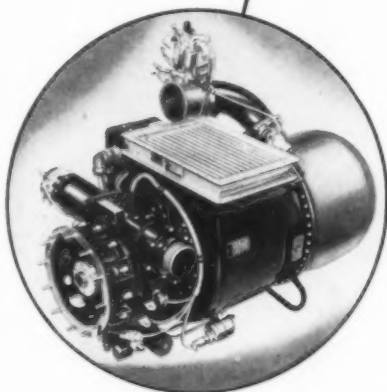
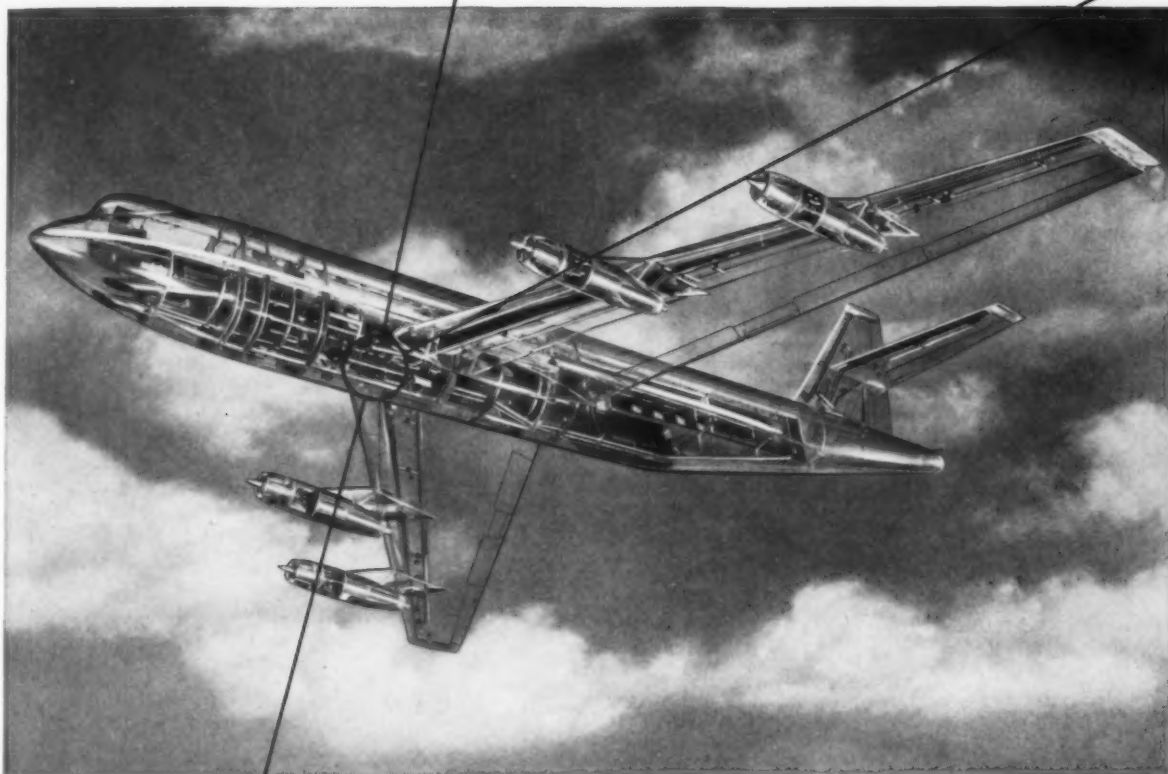
Indicate your preference as to location between
Los Angeles and Phoenix.



AiResearch
Manufacturing
Divisions

AMERICAN AVIATION

Complete auxiliary power



HEART OF THE AIRESEARCH AUXILIARY POWER SYSTEM

This small gas turbine compressor power unit supplies both compressed air and shaft power, has proven diversity on the ground as well as in the air.

in one system

This self-contained power system provides economical and efficient operation of vital components on aircraft and missiles.

Power to start main engines... power for cabin air conditioning on the ground and in flight... power for electronics, electrical and hydraulic applications... emergency power for operating control systems.

As in other AiResearch aircraft and missile systems, the components in this pneumatic power system are designed and manufactured to operate with absolute compatibility with one another.

This insures top performance and ease of maintenance — a unique advantage because only AiResearch has the broad range of development, manufacturing operational, and service experience to make it possible.

• *Qualified engineers in the fields listed below are needed now. Write for information.*



AiResearch Manufacturing Divisions Los Angeles 45, California • Phoenix, Arizona

Designers and manufacturers of aircraft systems and components: REFRIGERATION SYSTEMS • PNEUMATIC VALVES AND CONTROLS • TEMPERATURE CONTROLS

CABIN AIR COMPRESSORS • TURBINE MOTORS • GAS TURBINE ENGINES • CABIN PRESSURE CONTROLS • HEAT TRANSFER EQUIPMENT • ELECTRO-MECHANICAL EQUIPMENT • ELECTRONIC COMPUTERS AND CONTROLS



Problem: in an aircraft emergency, how to evacuate the plane in 90 seconds or less—the estimated time that occupants are physically capable and the crew able to lead the escape.

For AIR CRUISERS, construction of an escape slide to meet this exacting need became an impressive challenge involving eleven major design objectives.

Recent Air Force tests show how capably the challenge was met. "Inflatable Escape Slide—Type 10" promises to be another major achievement in a field in which AIR CRUISERS has won first place: *aircraft survival equipment for the airlines and Armed Services.*

AIR CRUISERS, the only manufacturer which conducts continuous research in survival equipment, is America's most experienced fabricator of inflatable rubber and rubberized materials.

Contributing to this specialized science is another division of The Garrett Corporation—AiResearch. From AiResearch laboratories and engineering come integrated components for automatic inflations which are the world's most advanced in design and quality... sharing in the progress toward "Survival Unlimited!"



AIR CRUISERS DIVISION

BELMAR, NEW JERSEY

This is no time for **SECOND GUESSING...**

One out of every ten people who work at Republic Aviation is an engineer. They represent 38 different skills and the combined experience of more than 9,000 years of aircraft development.

It was the high calibre of this engineering ingenuity which delivered to various U. S. Air Force commands a number of "firsts" that marked milestones in aviation progress.

Vision and operational versatility were significantly enhanced when a Thunderjet made the first jet non-stop Atlantic crossing demonstrating the possibilities of inflight refueling. The first fighter with "atomic capability" was a Thunderjet. The RF-84F Thunderflash is the first swept-wing fighter specially designed for armed photo reconnaissance. The F-84F Thunderstreak holds the new official transcontinental speed record of 652 m.p.h.

The same skill, vision and many thousand hours of priceless experience which inaugurated these advances in aeronautical science, will be utilized in designing and building Thunder-craft of the future.

REPUBLIC AVIATION



FARMINGDALE, LONG ISLAND, N. Y.

Design and Builders of the Incomparable **THUNDER-CRAFT**

People

MANUFACTURING



Ridenour

Dr. Louis N. Ridenour appointed director of research laboratories of Lockheed's missile systems division.

Dr. Harold V. Gaskill named vice president in charge of planning, Collins Radio Co.

Crockett A. Harrison to head new market research and development department of Bendix Aviation Corp.

John J. Jarosh appointed director of Sterling Precision Instrument Corp.'s new Cambridge Engineering Laboratory.

Albert Stanley Fischer appointed admin. asst. to the director of research and development of Kawneer Co.

W. A. Reichel elected senior vice president in charge of engineering for General Precision Equipment Corp.

John M. Palmer appointed mgr. of manufacturing for Raytheon Mfg. Co.'s receiving tube division.

R. L. Coffey appointed mgr. of military requirements department, Allison Division, General Motors.

H. J. Chase named works manager for Lockheed Aircraft Service-International.

Robert G. Rosenbaum made vice president and gen. mgr. of Florida Flight Engineering Corp.

Rear Adm. G. H. DeBaun (USN, ret.) named executive asst. to vice president of Aircraft Radio Corp.

John J. Giba appointed vice president in charge of new contracts division, American Bosch Arma Corp.



Reichel

O. C. Walley and **R. G. Dobbin** named chief project engineers heading sections developing alternating-current electric systems and direct-current systems respectively of Jack & Heintz, Inc.

Harry H. Kendall named advertising and sales promotion mgr. of Cleveland Pneumatic Tool Co.

Joseph A. Frabutt, gen. sales mgr. of Federal Telephone and Radio Co., appointed vice president in charge of Pacific division.

AIRLINE

Douglas Roberts named advertising mgr. for Canadian Pacific Airlines.

G. Marion Sadler promoted from sales mgr. at Buffalo to director of passenger sales for the American Airlines system.

Trans-Canada Air Lines announces the following appointments: **D. W. E. Bryce-Buchanan**, general supervisor of printed advertising; **D. G. Palliser**, gen. supervisor of display advertising; **L. O. Whiteside**, advertising distribution supervisor; **M. W. S. Eagles**, mgr. of marketing research; **C. I. Taylor**, gen. supervisor of budget and analysis service; and **C. A. Woolley**, mgr. of traffic scheduling.

Leonard S. Kimball appointed vpublic relations for The Flying Tiger Line.

MILITARY-GOVERNMENT

Brig. Gen. Brooke E. Allen, commander of Military Air Transport Service's continental division, Kelly AFB, Tex., promoted to major general at the same base.

Joseph S. Marriott, regional administrator for CAA's Fourth Region, retires January 31.

Lt. Col. Guy M. Townsend becomes deputy director of operations, USAF Strategic Air Command, Castle Air Force Base, California.

Col. Richard L. Temple, USAF, named deputy commander Second Air Division, Dhahran, Saudi-Arabia.



Allen

SOUTHERN CALIFORNIA AVIATION HEADQUARTERS

HOLLYWOOD PROFESSIONAL BUILDING

Ideally located for the Aviation industry, near the Freeways and adjoining the Hollywood Roosevelt Hotel and its new Million-Dollar Garage.

Selected by many Aviation Industry leaders for West Coast Headquarters.

You, too, will like the convenience and comfort of several excellent offices now available—at reasonable cost.

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Phone: HOLLYWOOD 4-2173

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Engineering Instructors NEEDED IN CALIFORNIA

- The current expansion program of
- Northrop Aeronautical Institute is
- creating several permanent openings for industry-experienced men,
- with or without teaching experience, to instruct in the various
- phases of practical Aeronautical
- Engineering.

FULL OR PART TIME

- Retired or semi-retired persons
- who desire to reside in Southern
- California can be employed for as
- little as two or three hours per day.

AMERICAN CITIZENSHIP NOT REQUIRED

- If interested write today for full
- particulars. Please send brief resume of experience and background.
- Address:

James L. McKinley, Director

NORTHROP AERONAUTICAL INSTITUTE

- 1193 W. Arbor Vitae Street
- Inglewood 1, California



WRIGHT DAY TROPHY WINNERS. National Aeronautic Association president Tom Lanphier, Jr. (left) looks on as Vice President Richard Nixon presents Wright Award to Dr. Hugh L. Dryden, NACA; Collier Award to Richard Travis Whitcomb, NACA, and Brewer Award to Willis Brown, aviation education specialist, Dept. of Health, Education and Welfare.

32 CONSECUTIVE ISSUES
Sperry Gyroscope Co.

28 CONSECUTIVE ISSUES
McDonnell Aircraft Corp.

27 CONSECUTIVE ISSUES
Pioneer Parachute Co., Inc.

26 CONSECUTIVE ISSUES
Fairchild Aircraft Division
General Electric Co.

24 CONSECUTIVE ISSUES
Reeves Brothers, Inc.

23 CONSECUTIVE ISSUES
Flightex Fabrics, Inc.
Parker & Co.
Sinclair Refining Co.

20 CONSECUTIVE ISSUES
Goodyear Tire & Rubber Co.

19 CONSECUTIVE ISSUES
Elastic Stop Nut Corp. of America

18 CONSECUTIVE ISSUES
Michigan Seamless Tube Co.

17 CONSECUTIVE ISSUES
Eclipse-Pioneer Division
Paper Manufacturers Co.

16 CONSECUTIVE ISSUES
Aeroquip Corp.
Instrument Associates
Jack & Heintz, Inc.
Lavelle Aircraft Corp.

15 CONSECUTIVE ISSUES
The BG Corporation
Greer Hydraulics, Inc.

14 CONSECUTIVE ISSUES
Aero-Coupling Corp.
Electrical Engineering & Mfg. Corp.
Nutt-Shel Co.
Pittsburgh Plate Glass Co.

13 CONSECUTIVE ISSUES
Air-Parts, Inc.
Aircraft Engine & Parts Corp.
Bendix International Division
Durham Aircraft Service, Inc.
Lear, Inc.
Rohr Aircraft Corp.
Titellex, Inc.

12 CONSECUTIVE ISSUES
Air Associates, Inc.
Air Carrier Engine Service, Inc.
Bendix Products Division
Esso Aviation Products
Teco, Inc.

11 CONSECUTIVE ISSUES
The Aerotherm Corp.
Breeze Corporations, Inc.
Convair
Simmonds Aerocessories, Inc.

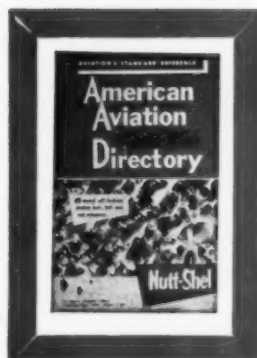
10 CONSECUTIVE ISSUES
Airwork Corp.
American Air Filter Co., Inc.
American Phenolic Corp.
Boots Aircraft Nut Corp.
The New York Air Brake Co.
Scintilla Division
F. W. Stewart Mfg. Corp.
The Weatherhead Co.

8 CONSECUTIVE ISSUES
Ace Products Co.
AirResearch Mfg. Co.
Aircraft-Radio-Marine Export, Inc.
Thomas A. Edison, Inc.
Pete Bros. Gear & Machine Corp.

Kollsman Instrument Corp.
Minneapolis-Honeywell Regulator Co.
Steel Products Engineering Co.

7 CONSECUTIVE ISSUES
Aerodex, Inc.
Hartman Electrical Mfg. Co.
L. B. Smith Aircraft Corp.
Twin Coach Co.

6 CONSECUTIVE ISSUES
Bendix Red Bank Division
Ces Bee Chemical Co., Inc.
Fairchild Engine Division
Guardian Electric
Scott Aviation Corp.
A. E. Ulmann & Associates, Ltd.
Vickers, Inc.
Weber Aircraft Corp.



WILL YOUR COMPANY BE IN AVIATION NEXT YEAR?

Here are seventy-six of the companies who form the backbone of aviation in war or peace. Their names and the products they make, the services they offer, are part of the vocabulary of aviation. ■ Among hundreds of other companies, these have advertised, without exception, consistently and continuously in the past five or more consecutive issues of the aviation world's only all-inclusive company and product directory. ■ The basic minimum for every sound aviation advertising program is AMERICAN AVIATION WORLD-WIDE DIRECTORY

Spring-Summer 1956 Issue: Closing Date, February 1

Advertising Offices: American Aviation Publications
LaGuardia Airport, N.Y.C.

5 CONSECUTIVE ISSUES
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Cleveland Pneumatic Tool Co.
Hardman Tool & Engineering Co.
Marquardt Aircraft Co.
Ryan Aeronautical Co.
Standard Electronics Div. of Hupp Corp.
Western Gear
Wm. R. Whittaker Co., Ltd.

"...It's also cocktail time on El Conquistador!"



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Send your customers on Braniff because—Braniff makes the difference!



BRANIFF *International* **AIRWAYS**

• serving 52 cities inside U.S.A. and 8 Latin American countries •

JANUARY 16, 1956

73



AIRBORNE

Where they're made. This is an aerial view of the main Aero Division plant in Minneapolis. Over 15,000 square feet of its 12 acres of modern plant are devoted to gyro assembly alone. Over 5,000 people work on aeronautical controls. Hundreds of these work exclusively on gyros, making Honeywell a leading specialist in the gyro business.



GYROS

Why they're so dependable. Honeywell gyros are assembled in air conditioned, pressurized rooms guarded by a double air lock. To control lint and dust, workers are required to wear special caps and gowns. With test and production facilities unequalled in the business, Honeywell produces thousands of precision gyros a month.



by **HONEYWELL**

How to find out all about them. Honeywell gyros are available to manufacturers who require precision performance. For details write on your business letterhead to Dept. 1001, at the address given below. Or, if you'd rather, pick up the telephone and call Sterling 1-8011 in Minneapolis.

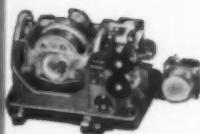


2600 Ridgway Road, Minneapolis 13, Minnesota

VERTICAL

Cageable Vertical Gyro, JG7044

Ideal as a vertical reference. For use in radar stabilization, fire control, bombing, navigation and flight control systems. Uncages in 3 seconds—cages in 10 seconds.



Vertical Gyro, GG33

A proven vertical reference gyro with unusual reliability and sensitivity. Presently being used on missiles, radar stabilization and navigation systems.



No single gyro can meet all applications. One of these should match your needs.

FLOATED

HIG-4 Gyro, GG14

Lightweight, extremely accurate floated gyro being used on the latest fire control systems. Most accurate and sensitive of the miniature gyros.



HIG-5 Gyro, GG1

Most popular of the fully floated integrating gyros. There are over 15,000 of these versatile, precision gyros in use.



HIG-6 Gyro, GG12

The world's most accurate production gyro. Yet a very small package that gives the extreme sensitivity and accuracy required for inertial stabilization.



RATE

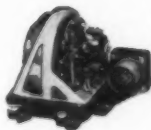
Rate Gyro, JG7005

A general application rate gyro whose dependability and accuracy has been proven through many years of service in a multitude of different aircraft control systems.



Rate Gyro, GG13

Gives the ultimate in performance for a non-floated, damped Rate Gyro. Extremely rugged and light in weight.



Miniature Rate Gyro, GG16

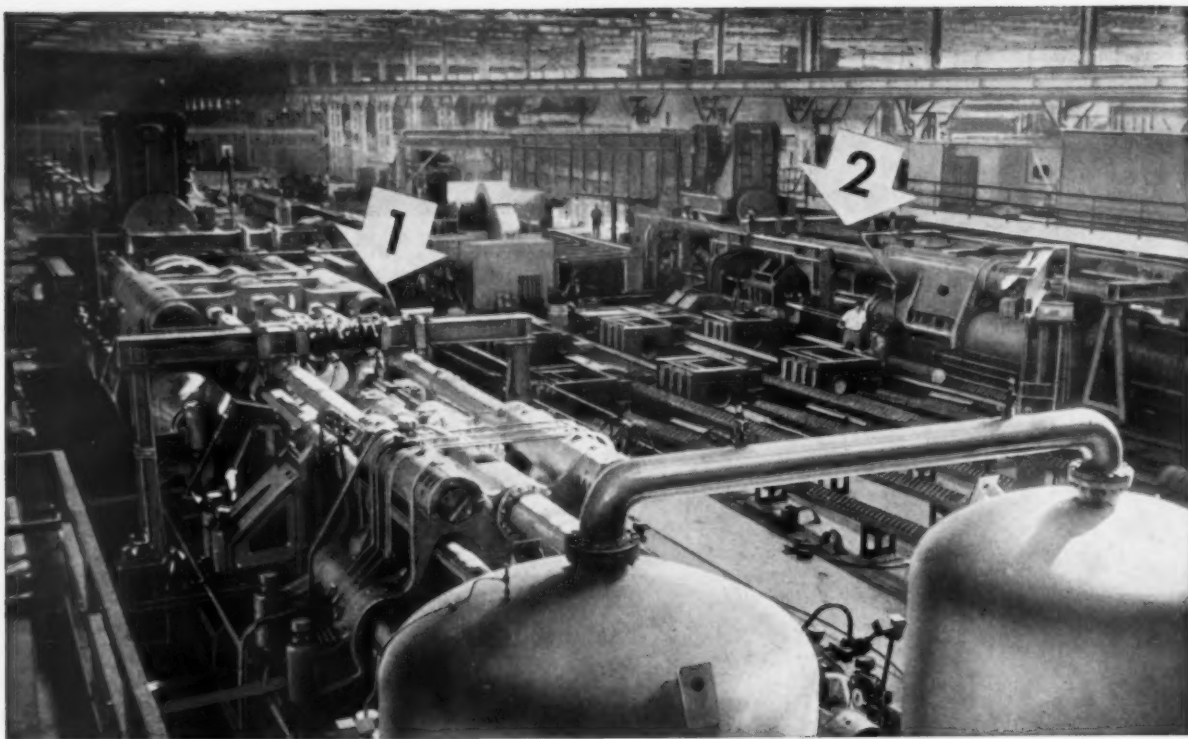
A viscous damped, spring restrained rate gyro giving the qualities of high precision, small size and ruggedness needed for missile and flight control applications.



MINNEAPOLIS
Honeywell

Aeronautical Division





Our two identical heavy presses protect against production delays

In November the Kaiser Aluminum heavy press facility went into operation at our Halethorpe, Maryland Plant.

We are the *only* producer of heavy extrusions with duplicate presses—identical in size and capacity.

As a result, regardless of any temporary shutdown of either press, *production can continue without interruption* because dies can be moved from one press to another without modification.

Thus, air frame manufacturers are assured greater protection against delays and disrupted schedules.

Soundest, highest quality extrusions ever made!

Billets produced for these presses are made using revolutionary degassing and metal-working techniques—a Kaiser Aluminum first, offered exclusively by us. Result: a new order of billet quality; virtually free from gas porosity; highest degree of freedom from inclusions.

Each of these heavy presses is capable of producing a

finished aluminum extrusion up to 17 inches wide, 85 feet long, and up to 1,200 pounds in weight. In many cases substantially wider extrusions can be produced depending upon section design.

Kaiser Aluminum's new plant is completely equipped with the most modern facilities and fully integrated for the production of heavy extrusions exclusively.

Our engineers have had long experience in extrusion design and application. You are urged to take immediate advantage of their services.

Contact Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

For details send for brochure, "Kaiser Aluminum Heavy Press Extrusions." Address: Room 6162 Industrial Service Division, Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland 12, California.

Kaiser Aluminum

setting the pace—in growth, quality and service

West Coast Talk . . . By Fred S. Hunter

- North American Airlines no longer small business.
- Safety record no mystery; operation well-managed.

JIM FISCHGRUND, often the spokesman for the North American Airlines partnership, likes to refer to the operation as "our little airline," explaining — reasonably enough that its annual revenue of \$15,000,000 is certainly a small amount counted in terms of a billion-dollar industry. On the other hand, any enterprise returning a profit in excess of a million dollars a year—which North American Airlines does—takes on the dimensions of big business in the eyes of most folk. North American, it might be added, also seems to be slipping outside the province of the government's Small Business Administration. The government's official definition of a small business is one employing no more than 500 persons. North American now has a payroll of 650.



Hunter

present North American grouping, Standard Air Lines and Viking Air Lines, did experience fatal crackups.

Lockheed will continue on military Super Constellations throughout this year. Deliveries on C-121Ds to the Air Force continue until October and the Navy keeps getting WV-2s until December . . . North American Aviation will take over the hangars which AiResearch Aircraft Service will vacate at Los Angeles International Airport when its new facility, now under construction, is completed . . . Convair,

which made a major design change in the F-102 fuselage in the switch-over to the coke bottle configuration, contemplates an alteration in the delta wing, but it will be down the road apiece.

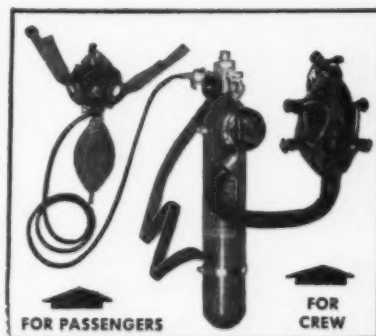
Question we're asked most often about North American Airlines is: How can you account for its safety record? It's no mystery. North American Airlines is not just another nonsked. It's a big-time well-managed operation. The fact the CAA has never cited it for a violation of any kind is evidence of this. It's well financed, and doesn't have to skimp or short-cut in any operations or maintenance procedures. Its operating policies are conservative. Until this winter, for example, its minimums were 400 feet and three quarters of a mile for landing, 300 feet and a mile for takeoff.

Not until North American Airlines had a background of experience did it lower minimums close to those of other carriers, 300 and three-quarters of a mile for landing, 200 and a quarter for takeoff with high intensity runway lights, 200 and a half without the high intensity lights. North American's CAB troubles stem strictly from its failure to play the game according to the rules economically, not mechanically. It probably also should be pointed out, however, that although it has never had an accident since operating under the North American Airlines banner, both predecessor operations, which were consolidated into the

Quite a feather in Ryan Aeronautical's cap was its successful bid to produce the jet power packages for the Douglas DC-8. Any time you outbid Rohr Aircraft in this particular field, where it has built up such a commanding leadership in the years since the war, you are entitled to take a deep bow. Ryan made exhaust systems for Douglas for the DC-3, DC-4 and DC-6 (Rohr makes the power packages for the DC-7 series) but this will be its first venture in producing complete packages. This, incidentally, sort of puts the Boeing-Douglas competition on a local basis in San Diego, with Rohr turning out assemblies for the 707 and Ryan for the DC-8. Rohr, we might add, also will make the power packages for the Lockheed Electra.

Hoffman Laboratories is now Hoffman Electronics' largest division, with 2,000 employees. Its largest production contract is on the ARN-21, the airborne portion of the TACAN system . . . West coasters were happy to hear of Gordon Christy's promotion to assistant sales manager of the Wright Aeronautical division . . . Hayden Aircraft, stretching out construction of the prototype of the Stout Bushmaster trimotor, is now scheduling completion for some time next summer instead of in April.

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Another B-52 source goes into action

When world conditions indicated the need for more B-52 global jet bombers, the Air Force ordered this vital defense weapon into accelerated production, and named Boeing's Wichita Division as the second source for B-52s.

Above—on schedule—the first B-52 rolls off the Wichita production lines. Earlier, while the Strategic Air Command was converting to B-47s, Boeing-Wichita turned out these six-jet bombers at a one-a-day clip. It is currently in its 49th consecutive month of on-schedule production. Now that B-52s are in stepped-up

demand, Boeing-Wichita has accomplished the tremendous task of continuing B-47 deliveries, and at the same time tooling up and going into production on the B-52. This feat demonstrates the vast range of the Division's facilities and manpower resources. It adds Wichita-built B-52s to the steady procession being turned out by Boeing's Seattle plant.

The B-52, along with the B-47, rounds out the striking power of the U. S. Air Force. This team of Boeing heavy and medium bombers will be joined later on by still another Boeing, the KC-135 jet tanker.

The design advances that give the B-52 its revolutionary performance required equally revolutionary production methods. The company's manufacturing divisions, as they had in the case of earlier Boeing designs, devised new ways to produce a new kind of aerial weapon—efficiently, in volume, and on schedule.

The B-52 is an intercontinental nuclear weapons carrier, with a gross weight of over 175 tons. It is capable of operating at speeds beyond 650 miles an hour and at altitudes over 10 miles. Its mission: to retaliate against any aggressor, anywhere.

BOEING

AMERICAN AVIATION

An investigating committee appointed by the revolutionary government of Argentina to look into the affairs of Aerolineas Argentinas during the Peron regime has disclosed that the state-owned airline's accumulated losses during the past five years amounted to the equivalent of some ten million dollars.

The committee's report said that one of the factors that crippled the company's finances was the number of free trips approved by the government; free transportation, either for passengers or freight, worth over one million dollars was approved in recent years, according to the committee.

In many countries of the world there are reductions for government employees on the national airline, which makes things tough for foreign carriers trying to compete. Quite frequently lower fares may be granted to other categories of passengers.

• For example, the Brazilian congress recently extended legislation under which the nation's subsidized airlines must give "at least 50% discount to Brazilian congressmen and newspapermen traveling in line of duty within the country or abroad."

Brazil has a unique subsidy system for its airlines. The government pays on a per-kilometer-flown abroad basis. Until recently it was at the rate of 33 cents for each kilometer flown between the last Brazilian stop and the final foreign point. Now, however, it varies according to type of equipment: 22 cents for twin-engine non-pressurized aircraft; 33 cents for twin-engine pressurized aircraft and four-engine non-pressurized equipment; and 44 cents for four-engine pressurized aircraft.

• The Brazilian government also recently introduced a rather unusual fare structure for domestic airlines in order to permit higher fares to be charged for superior equipment. There are now three fare levels:

(1) the former basic fare plus 5% for travel in Super Constellation, Constellation and Convair equipment; (2) the basic fare less 10% for flights in DC-4, Scandia and "de luxe interior" C-46 equipment; and (3) the basic fare less 20% for flights in DC-3 and ordinary C-46 equipment (between April 15 and June 30 the basic fare less 25% may be charged for flights in these two types of aircraft).

Scottish Transport to Tour Far East



Scottish Aviation's Twin Pioneer is being prepared for a demonstration tour of the Far East. Latest photo of the twin-engine transport shows the slotted extension flaps and slats extended for landing.

Italians Plan Helicopter Network

A project to establish what would probably be the world's most extensive helicopter network has been developed by Antonio Farini, an aviation consultant, at the request of an Italian industrial group headed by Fiat. The company would be known as Eli-Linee Italiane (ELI) and, according to Farini's recommendation, should have both Alitalia and LAI among its stockholders. Capital would be about \$1,200,000.

Initially the helicopter company would operate six Sikorsky S-55s bought or leased from SABENA Belgian World Airlines. Subsequently about two years later, it would buy some larger Piasecki or Sikorsky models.

The ELI network would stretch from northern to southern Italy. The main trunk route, to be operated throughout the year, would connect

Rome with Nice via Siena, Florence (Viareggio and Rapallo during the summer) and Genoa. The northern network would include Genoa, Turin, Milan, Malpensa airport, Como, Varese and Lugano. The southern system would connect Rome with Naples, Sorrento, Capri and Ischia. The northern and southern systems would operate only from April 1 to October 31.

Farini's study shows that approximately three million seat-miles would be offered annually with an anticipated production of two million passenger-miles. About 85% of the operating costs would be covered by subsidies from the government and local communities, the balance coming from a basic fare of 18 to 20 cents per seat-mile. On this basis an annual subsidy of \$1 million would be required.

Transport Briefs

Panair do Brasil will take over four of the 25 Douglas DC-8s ordered by PAA . . . Aviaco, Spanish independent, is buying four more SNCASE Langue-docs . . . Alitalia will extend its operations to Johannesburg in the spring . . . Canadian Pacific Airlines has ordered four more DC-6Bs in early 1957; it is already due to get four early this year to supplement its present four. Air France has ordered four more L-1049G Super Constellations, bringing its total of Lockheed Constellation-type aircraft in service or on order to 53.

Silver City Airways has ordered three additional Bristol 170 Superfreighters, bringing the carrier's fleet to

18 Model 170s—six Freighters and 12 Superfreighters . . . Air Austria has ordered four Viscount 800s for delivery in the fall of 1957; the carrier will start operations this spring using DC-3s and DC-4s . . . Finland's Aero O/Y will open its Helsinki-Moscow service February 18.

Manufacturing Briefs

Rolls-Royce expects that the Dart turboprop will reach one million airline hours in March; present airline flight hours are over 700,000 (not 175,000 as recently stated) . . . SNCA du Sud-Est will very soon start flight testing its Mach 1.5 level flight SE 212 Durandal lightweight fighter; powerplant is the Atar 101-G-21.

Operating Costs of Representative Business Airplanes

Operating costs for business aircraft are often something companies would rather not talk about. The following table on average costs for 16 representative types, however, was compiled by *Fortune* magazine, and published in its January issue, in connection with an article on the business flying boom.

	Average price	Annual operating costs (a)		Cost per passenger-mile (50% passenger load)	
		Flown 300 hours a year	Flown 600 hours a year	Flown 300 hours a year	Flown 600 hours a year
Piper Tri-Pacer	\$ 7,895	\$ 4,500	\$ 6,000	\$.064	\$.043
Mooney M-20	12,500	5,500	6,900	.062	.039
Cessna 180	14,000	6,500	8,200	.080	.051
Beech Bonanza	22,000	9,300	11,700	.086	.060
Hello Courier	25,800	9,800	11,800	.117	.070
Piper Apache	36,790	13,900	17,200	.151	.094
Riley Twin-Navion	37,500	14,200	17,700	.155	.096
Cessna 310	60,645	28,500	33,400	.258	.151
Grumman Wildcat	70,000	30,900	36,100	.338	.197
Beech Twin-Bonanza	78,000	33,900	40,200	.251	.149
Aero Commander	79,500	33,400	38,800	.275	.160
De Havilland Dove	108,450	49,500	56,600	.331	.189
Beech Super-18	125,000	54,400	63,100	.313	.182
Lockheed Lodestar	175,000	93,500	119,000	.321	.204
Douglas DC-3	240,000	103,500	127,500	.274	.154
Convair 340	750,000	240,300	280,300	.313	.183

(a) Covers all major operating and fixed costs, including crew's salary for all planes larger than the Riley Twin-Navion.

To achieve these reductions, Cessna has incorporated: an interconnected exhaust system that feeds into a single relocated exhaust stack; engine-mount suspension which largely eliminates transmission of engine vibration to cabin section; and new windshield a quarter of an inch thick to insulate the cabin. New tail wheel control system is also featured. Price remains \$12,950.

Skeets Coleman Designs Roadable Amphibious Plane

A delta-wing amphibious roadable aircraft has been designed by J. F. "Skeets" Coleman, Convair engineering test pilot and Harmon Trophy winner. Currently under construction, the "Aeromarine" will be powered by a 215-hp Franklin engine with a pusher propeller. It is expected to cruise at 200 mph with a 225 mph top speed and a range of 800 miles on 80 gallons of fuel.

The Aeromarine is expected to have medium-performance automobile characteristics with a speed of about 50 mph on land. The 43-degree sweepback of the wing will provide a wingspan of 25 feet with overall length 18 feet. Wings will fold to the sides for use as a car.

New Lycoming Engine For Aero Commander

Aero Design & Engineering Co. has announced that the new Lycoming high-compression engine (GO-480-C1B6) has been made available for use in the Aero Commander 560A as optional equipment. This version will be called the (HC) 560A and will retail for \$76,500. The standard 560A is powered by two Lycoming GO-480-D1A engines and continues to sell for \$74,500.

The new engines are basically similar to the standard. Take-off rating is 295 hp, rated hp 280 and compression ratio 8.7 to 1. It features chrome-plated cylinders, longer pistons and heavier bearings, using 100/130 octane fuel.

With the (HC) 560A added, Aero Design's line now includes three versions of its Aero Commander with the standard 560A and Supercharged 680 announced last Fall.

Cessna 180 Features Less Noise, Vibration

Reduced noise and vibration are reported for the 1956 version of the Cessna Model 180, despite a boost in horsepower in the Continental engine to 230 hp.

Even Railroad Men Like To Fly



Railroad executives take to the air, as the Chesapeake and Ohio Railway Company announces lease of a DC-3 for business use from Capital Airlines. The "flying office car" has been fitted out as a railroad office with lounges, conference room and secretary's office.

Shown at the conference table discussing leasing arrangements are (left to right) James H. Carmichael, president of Capital; Walter J. Tuohy, C&O president; James W. Austin, Capital's vice president of traffic and sales, and John E. Kusik, C&O's vice president of finance. C&O took delivery on its plane at the end of December.

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and producing these complex high-temperature structures. Ryan is uniquely skilled and equipped to build the first experimental units of difficult designs and then streamline these prototype designs for efficient low-cost, volume production of the final models.

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TRANSPORT TRENDS

Washington, D. C., Jan. 16, 1956

FUTURE STATUS OF RECENT LIBERAL AWARDS by CAB to non-scheduled airlines now hinges on actions by the White House and the U.S. Court of Appeals. Slated to take effect January 1, the awards were stayed (1) on all phases until January 15 by a temporary Court order and (2) on foreign and overseas portions by direct order of the White House.

Court's restraining order applies until after a hearing of certificated carriers' petitions for a long-term stay and review of the controversial CAB decision. That hearing was scheduled for January 12.

Eleventh-hour intervention by the White House came after CAB decision was challenged on grounds that foreign and overseas grants to nonskeds can be made only with Presidential approval, as in certificated route cases. That stay is indefinite pending White House study.

Meanwhile, the CAB majority of Rizley, Adams and Lee (whose term expired last month) turned down all petitions for reconsideration of their decision, which the certificated airlines and nation's railroads charge went beyond the Board's statutory authority and completely submerges the present system of common carrier regulation.

TRANSPORT BUYING SPREE by airlines in 1955 set all kinds of records. At Lockheed Aircraft Corp. alone, orders for four types (1049G, 1049H, 1649A and Electra) were worth \$335 million, four times its previous annual high of \$83 million in 1953. Total aircraft numbered 177 for 17 airline customers.

FIRST NON-BRITISH AIRLINE to order the "new" Comet jet transport may be Varig. The Brazilian airlines' president recently paid his second visit to De Havilland within a few weeks. The other major Brazilian international airline (Panair Do Brasil) is buying four DC-8s.

Meanwhile, Boeing Airplane Co. is preparing to launch a campaign to sell its 707 in Latin America. A team will soon leave for South America to call on top airline and government officials. Among countries to be visited are: Argentina (Aerolineas Argentinas); Brazil (Varig and Panair); Colombia (Avianca); and, Venezuela (LAV).

WHITE HOUSE HAS SET some stiff qualifications for its appointee in filling the CAB vacancy to be created when Chairman Ross Rizley gets his federal judgeship. It is looking for—and still hasn't found—a man with business experience, preferably with FBI clearance, and with no airline interests, connections or backing.

Meanwhile, little time is expected to elapse between nomination of Rizley for the Oklahoma judgeship and confirmation by the Senate Judiciary Committee, despite that group's reputation for slowness on such nominations. Main reason is that ex-Congressman Rizley knows all the right steps to take.

CONFIDENCE IS ON THE GAIN within Republican ranks that, despite certain questions raised in connection with the nomination of G. Joseph Minetti to the CAB, Senate approval will be forthcoming before the end of the month. Minetti, a Brooklyn Democrat, would fill the vacancy created when Josh Lee's term expired on December 31.

TRANSPORT AVIATION

CAB Record Puts Administration on Spot

Board's prestige suffers as result of leaks, pressures and hasty decisions; believed vulnerable target for investigators.

By WILLIAM V. HENZEY

THE Eisenhower Administration, obviously on the spot in the current Presidential election year, must now revive efforts to establish the proper atmosphere of prestige for the Civil Aeronautics Board.

Leaks, pressures, membership turn-overs and threat of industry-wide chaos which could result from hasty Board decisions have once again made the agency a vulnerable target for political opportunists.

An attempt to raise the Board's prestige was made last year when Ross Rizley took over the chairmanship with a White House mandate to apply the Board's little-used code of ethics. The knowledge that the code might be applied, plus Rizley statements that he personally would not condone unethical practices (AMERICAN AVIATION, April 11, 1955.) had an initial, though temporary, advantageous effect.

* In the swirl of activity centering around numerous major decisions in the last quarter of 1955, apparently too much happened to permit proper enforcement of the code, so limited was the time of the Board on any one

particular topic.

CAB's decision in the Denver Service Case, involving extensive new route grants in the west, leaked prematurely and resulted in a Rizley threat to top CAB officials that a recurrence would surely bring in the FBI for a thorough investigation.

A Rizley-sponsored plan for free travel for Board employees on certificated airlines got off on the wrong foot because the "other side" was given out from inside CAB to various press media.

The agency's decision in the Southwest-Northeast Case, perhaps the biggest domestic airline route case of all time, appeared in an eastern newspaper the day before CAB itself released it publicly.

A CAB statement in connection with expenditures for air traffic control purposes, which the Board says never had been made final, appeared in print as a recommendation to the Air Coordinating Committee and repercussions are still being felt.

Pressures Mount

- On the other side, pressures on Board members, which had tapered off

during the early stages of Rizley's regime, increased to a new high toward the end of the year.

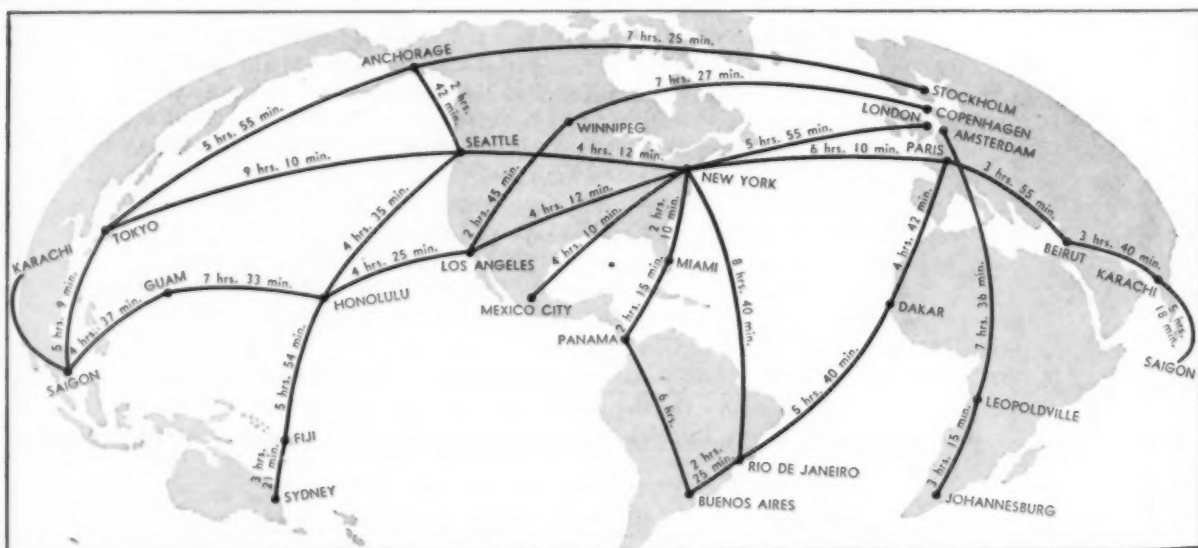
Rizley himself, in a major policy speech at Enid, Okla., on Nov. 18, complained of pressures from members of Congress. Josh Lee, whose term came to an end Dec. 31, reportedly was advised on several occasions that his job could be saved by voting the "right way" on several pending matters.

But this type of activity reached the degrading stage in December when one member whose name will be withheld purposely, "broke down" under the strain of threats to his personal future right before Christmas.

One of the threats to this member was advice to "remember that this is a two-way street."

• **Aside** from the merits of the decisions involved in these instances of pressure, it should be noted to the credit of the individual members that no votes were changed or influenced by the pressure attempts.

However, whether the situations that provoked such desperate measures can be condoned is also open to considerable doubt.



Jules Verne wrote about getting around the world in 80 days but Boeing estimates that the same trip on its 707 jetliner will require only 39 hours and 50 minutes of flight plus seven hours of stops when Pan American and American Airlines put the plane in service.

The CAB last year decided more important cases in a short space of time than perhaps in any previous comparable period in its history. Largely, this was to satisfy criticism heaped on CAB at Congressional appropriations hearings each year. The Board's big backlog of cases is a favorite Congressional target.

• But the pressure generated by meeting the stepped-up schedule of activity apparently proved the undoing of Rizley's original plan to raise the dignity of the Board to the level of the civil Courts.

Within CAB, two factions of Board members developed, pitting Chairman Rizley, Vice Chairman Adams and member Josh Lee against the Republican team of members Chan Gurney and Harmar D. Denny. At a lower level, the Board's staff split into what may be termed a "new guard" and an "old guard."

The result of this split-up was that the Rizley-dominated majority and the new guard succeeded in getting de-

cisions out in a hurry, but the friction thus created was too much to assure the success of Rizley's anti-leak and anti-pressure campaigns.

End Not In Sight

• Unfortunately, the end of this situation will not come early or easily. CAB is in the courts on various fronts and some of its decisions, particularly that in the Large Irregular Investigation, could so undermine the Civil Aeronautics Act as to inspire a separate Congressional investigation.

Already, the Board is in the unenviable spot of being a tag-along partner in Senator Monroney's investigation of CAA and possible Commerce Department dominance of important phases of aviation.

On top of this, the Administration is now scurrying to find a replacement for Rizley who, at this writing, was expected to be named to a Federal judgeship at any time. Very few individuals are interested in the hot spot.

• Rizley's departure, following shortly after that of Josh Lee, changes

the 3-2 picture which has prevailed throughout the important 1955 decisions. Only Vice Chairman Joseph P. Adams will remain of that majority to contest Republicans Gurney and Denny. Member-nominee G. Joseph Minetti (Lee's successor) and Rizley's replacement, of course, are unknown factors at this point.

At the staff level, the most dynamic force of the "new guard," Robert Kunzig, Rizley's assistant may stay with Rizley's replacement or seek a new position. Rizley's general counsel, Franklin Stone, is a candidate to replace Rizley in the top Board spot.

In all, it is not a pretty picture of stability at CAB for an election year, but it is not the first time such a situation has existed. Some real concentration by top Administration officials in the next few months, however, plus an awareness of the judicial responsibilities of Board members by Congress, the industry, and the members themselves would be most welcome at this point. ♦ ♦ ♦

Which Engines for Commercial Jet Era?

P&W, Allison Gain Long Lead in Turbine Race

• Other producers must move fast to win slice of airliner business.

By ROBERT M. LOEBELSON

With orders for commercial gas-turbine-powered transports approaching the 300 mark last week, the nation's major engine producers starting appraising their present and future roles.

The three principal builders of jet and turboprop airliners now have solid backlogs:

• Douglas has orders for a total of 103 DC-8s and an additional 13 are on option.

• Boeing's backlog involves 72 Model 707s with options probably involving about a half dozen or so more.

• Lockheed has sold 104 of its turboprop Electras and, according to reliable reports, has granted options on 55 more.

The three airliners, in virtually every sale to date, will use the engines of two manufacturers—Pratt & Whitney in the case of the DC-8 and the 707 and Allison for the Electra. (Some foreign airlines are still studying the possible use of British-built turbojets for their 707s and DC-8s.)

• Pratt & Whitney, which lagged in development of turbojet engines during and just after World War II because the Government asked it to concentrate on reciprocating power plants, began a gas turbine development program involving the bulk of more than

\$175 million spent by United Aircraft Corp. in the last 10 years and evolved the 10,000-pound-thrust J57. To succeed that jet, P&W is coming up with the 15,000-pound J75, although the larger engine will probably be derated to about 13,000 pounds for civil airliner use.

On the turboprop side, the East Hartford, Conn., company is already out with the 6,000-hp T34 (which will probably not be developed in time to be a satisfactory commercial engine) and is working on a turboprop variation of the J57, the 15,000-hp T57, now slated for use in the 100,000-pound-payload Douglas C-132. Presumably the T57 might serve in a giant commercial cargo-transport. In any case, the J57 and the J75 are destined for both the 707 and the DC-8.

• General Motors' Allison Division got into the turboprop business at an early stage with the 2,750-hp T38 and the 5,500-hp T40. But neither of these engines aroused too much enthusiasm for either military or civil use because of various bugs, notably gear box troubles. The successor engines, the 3,750-hp T56 and the 7,500-hp T54, have met with better success, with the T56 going into Lockheed's C-130A cargo plane for the USAF and being ordered by three airlines for the Electra transport.

(At one time, GM's top officials were pondering whether to get out of the aviation business entirely but ultimately decided to back Allison completely. The corporation authorized a \$75 million expansion program, scheduled for completion in 1959.)

Others Must Move Fast

With P&W presently dominant in the turbojet field and Allison apparently supreme in turboprops, the other large engine manufacturers are facing the problem of moving fast if they hope to capture part of the lucrative commercial market or else being content with the three or four percent profit that military work yields.

• General Electric's vice president for Atomic Energy and Defense Products, C. W. LaPierre, has expressed GE's intention of cracking the commercial market. Toward that end the firm is planning to lay out \$40 million of its own money for expansion of Aircraft Gas Turbine Division plants at Evendale, Ohio, and Lynn, Mass., over the next five years.

Commercially, GE hopes that its lightweight J79 (thrust about 13,500 pounds), which is set for the military Lockheed F-104B and the supersonic Convair XB-58 delta bomber, might be satisfactory. Beyond that GE has a

Orders for U.S.-Built Gas Turbine Airliners

Douglas DC-8		Boeing 707	
Pan American	25	*Pan American	20
United	30	American	30
Eastern	19	Air France	10
KLM	8	Braniff	5
SAS	7	Continental	4
National	6	Sabena	3
Japan Air Lines	4		
Panagra	4		72
	102		
Lockheed Electra		Options	
Eastern	40	DC-8—Eastern 8, SAS 3, Panagra 2.	
American	35	707—Sabena 2, Air France undis-	
National	20	closed.	
Braniff	9	Electra—Eastern 30, American 25	
	104	reported.	

*PAA has changed its 707 order to cover 12 intercontinental airliners. Total number of 707s for PAA is therefore obscure.

ducted fan (by-pass or turbo-fan) engine which it is developing and which, it is certain, will find many civil and military applications.

On the turboprop side, the Lynn, Mass., facility is working on the T58 (850-1,000 hp) which is being considered not only for several military light planes and helicopters but for several civil projects (including the Sikorsky S-58) as well. GE is also conducting negotiations with Britain's Napier company so that it can be built in the U.S. if American airframe companies express a desire for the 4,000-hp Eland turboprop. (Convair has proposed several turboprop versions of its Model 340, including one using four British Rolls-Royce Darts, one powered by two T56s, and another employing two Elands.)

Curtiss-Wright Trails

*Curtiss-Wright would appear to be somewhat behind P&W, Allison and GE in the commercial field, although the Wood-Ridge, N. J., enterprise is certain that its R-3350 Turbo Compound (a reciprocating engine) will be selling for several years to come. As a hedge, Wright is putting more than \$20 million into a new research facility at Quehanna, Pa., for advanced study of turbojets, turboprops, ramjets and rockets.

C-W's 8,000-pound-thrust J65 does not appear a promising commercial engine and the 15,000-pound J67 is virtually dead by military edict. (Development work on the J67-ramjet combination continues under military sponsorship, however.)

Wright has also proposed a derated version of its 10,000-hp T49 turboprop (now flying on the Boeing XB-47D) for civil use but airlines, so far as is known, have shown little interest.

*Probably in the least favorable position as far as commercial sales are

concerned is Westinghouse Electric's Aviation Gas Turbine Division at Kansas City. Military work has all but run out there as the Navy ordered an end to output of the J46 and the J40, but the Navy is now evaluating a light-weight jet engine developed by Westinghouse with its own money, the J54, rated at about 6,000-pounds thrust.

Westinghouse put about \$16.5 million of its own cash into the AGT activity in 1955, including \$12.5 million for a single research laboratory and will undoubtedly allocate more if it can succeed in staying a Navy engine producer. But any hopes for commercial engine sales are obviously contingent on continued military output for Westinghouse, like the rest of the engine industry, depends on the military services to buy 80% or more of its production.

If the Navy does order the J54 into production, Westinghouse has some promising commercial engines to offer U.S. airframe builders through its licensing arrangement with Britain's Rolls-Royce, Ltd. Among them are the advanced RDa-8 Dart turboprop (2,400-hp), the RB-109 turboprop (4,500-hp) and the Conway turbo-fan (14,000-pounds thrust).

Lycoming Hopeful

Among the smaller engine companies, Avco's Lycoming Division is hopeful that its 850-hp XT-53 turboprop (currently set for Bell's XH-40 utility helicopter) will find commercial applications. Continental is convinced that its 1,000-pound J69 Marbore turbojet (used in the Cessna T-37 trainer) can be employed in jet executive aircraft (like the Morane-Saulnier/Beech MS-760) and Fairchild's Engine Division sees the 1,000-pound-thrust J44 as an auxiliary engine for transports and cargo planes.

In addition, Fairchild and GE are

working up 2,000-pound-thrust turbojets under USAF contracts which might also have commercial applications.

And there may also be a radical change in the propeller field. United Aircraft's Hamilton-Standard Division has been the leading supplier of commercial "fans" for piston airliners, greatly surpassing the sales of C-W's Propeller Division and Allison's Aero-products Operations.

But Aeroproducts props have been ordered by American, Eastern and Braniff for their Lockheed Electras to go with the T56s. The USAF, on the other hand, has specified Curtiss-Turboplectrics for the C-130 but is planning to evaluate a set of Aeroproducts propellers for possible substitution. Hamilton-Standard seems to be running a poor third in the market to supply propellers for turboprop engines.

As the new year begins and the nation's air carriers make plans for the gas turbine era, therefore, the emphasis seems to be shifting. Traditional suppliers of commercial equipment in some cases are unwillingly making way for new competitors in airframes (Boeing, which has not sold a commercial plane since its Stratocruiser), in engines (Allison, which never sold a power plant commercially) and in propellers (Aeroproducts, which has traditionally been the third ranked commercial producer).

Comet 3 Completes Globe-Circling Flight

The de Havilland Comet 3 ended its round-the-world demonstration and proving flight by flying nonstop from Montreal to London in 6 hours 18 minutes. It was the first jet transport to fly the Atlantic eastbound. Average speed for the transatlantic flight was 548 mph. The 30,041-mile flight around the world was accomplished in 66 hours 43 minutes flying time.

After the flight, de Havilland said some technical authorities, "notably the Americans in Hawaii," expected that a jet airliner would need a long runway; would climb at a flattish angle over the city of departure, causing a noise nuisance; would circuit, approach and land rather fast; would be unbearably noisy when standing and maneuvering in front of terminal buildings, and might even scorch the paving.

However, de Havilland added "it is now clear to all that the Comet has a short takeoff, steep climb, low landing speed and short landing run." The company said "the sight of the Comet landing on the short runway at Honolulu, pulling up within 3,000 ft. and turning off at the intersection impressed the Hawaiian Aeronautical Commission."



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European Airlines Formulate Plans For Coordinating Routes, Regulations

By ANTHONY VANDYK

At long last a determined attempt is being made to bring European air transport to a higher degree of efficiency for the benefit of both user and operator. The first session of the European Civil Aviation Conference which ended in Strasbourg last month laid the groundwork for a program aimed to make Europe, for civil aviation purposes, a coordinated whole. It was clear to all present at Strasbourg, however, that Europe's intense nationalism is going to make this a slow process.

Nonetheless, the ECAC's first meeting had concrete results as well as providing a forum for a thorough airing of the possibilities of a standardization of regulations and a streamlining of economic arrangements in Europe. It agreed on a constitution and on its working methods. And it prepared a draft multilateral agreement for non-scheduled services in Europe.

This agreement establishes freedom of operation for a number of categories of non-scheduled commercial flights, for example: (1) aircraft engaged in humanitarian or emergency missions; (2) transportation of passengers in air taxis (small aircraft with a maximum seating capacity of six passengers); (3) charter flights where there is no resale of space; (4) any flights which have a maximum frequency of once a month; and (5) all freight and passenger operations between regions which have no reasonably direct connection by scheduled services.

• The ECAC was less successful in finding a basis for a multilateral agreement for scheduled services within Europe and in the end it was forced to recognize that "the time has not yet come to develop a multilateral agreement to replace the present bilateral agreements in Europe."

Some delegates emphasized that in their opinion cooperation "in the two levels of governments and airlines" was the policy which could best obtain the greatest improvement in the situation. Advocates of this approach preferred a formal declaration by the states represented to the effect that (1) they favored direct services between states and (2) would refrain from opposing the establishment and operation of services of other member states unless they considered such services actually harmful to their own national airlines, or decided that they did not serve the best interests of the users.

A "study group" was set up by the conference to examine problems con-

nected with the interchange of aircraft—the ability of airlines operating internationally under governmental agreement or authorization to use aircraft belonging to a foreign airline and registered in a foreign state, with or without using the crew of the aircraft.

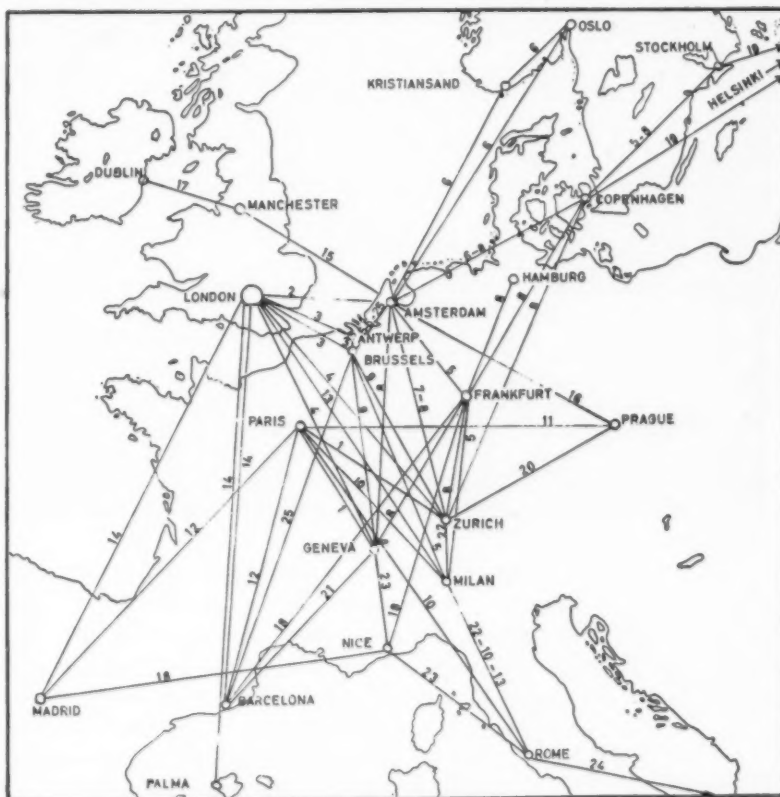
• Strasbourg was the birthplace of the ECAC. Its creation was decided at a special meeting in that city in the spring of 1954 on the coordination of air transport in Europe. This meeting, convened by the International Civil Aviation Organization at the request of the Council of Europe, discussed in general terms the whole question of cooperation in Europe. The first session of the ECAC could only pursue some of these matters but the new organization will tackle others at subsequent meetings.

The 1954 Strasbourg conference made specific recommendations concerning the abolition of visas, examination

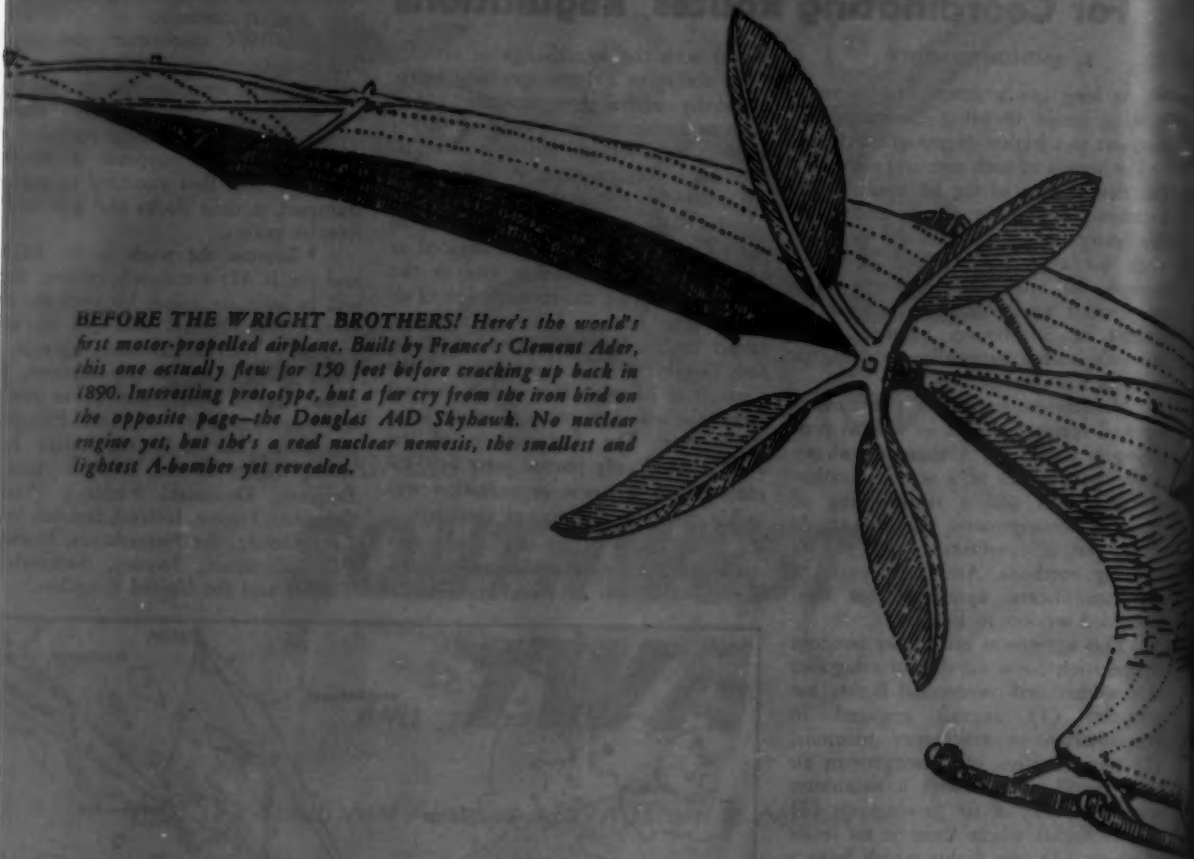
of baggage by customs on departure, the possibility of dispensing with the requirements for mail entries on air cargo manifests and the granting of freedom from sanitary controls.

The 1954 conference also urged that everything possible be done to reduce the time spent on the ground during stop-overs, and that states should try to insure that treatment accorded air transport at their airports is no less favorable than that accorded to surface transport at their docks and bus or rail frontier points.

• Because the work of the ECAC and the ICAO are closely related, there will be intimate liaison between the two bodies. The ECAC will call its own meetings and fix its own agenda. It will hold annual plenary sessions, the main task of which will be to review the development of intra-European transport. The following states have voting rights at the ECAC: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



One form of cooperation that already exists in Europe is the pooling of services (revenues are pooled but not expenses). The map shows the pooled services in Europe in 1955 except for the KLM/SABENA pool in Germany. The key is as follows: 1—Air France/Swissair; 2—BEA/KLM; 3—BEA/SABENA; 4—BEA/Swissair (winter night services only); 5—KLM/SABENA; 6—KLM/SAS/SABENA; 7—KLM/Swissair; 8—SAS/Swissair; 9—SABENA/Swissair; 10—Air France/Alitalia; 11—Air France/CSA; 12—Air France/Iberia; 13—BEA/Alitalia; 14—BEA/Iberia; 15—BEA/KLM/Aer Lingus; 16—KLM/CSA; 17—KLM/Aer Lingus; 18—KLM/SABENA; 19—KLM/SAS/SABENA; 20—KLM/Swissair; 21—SAS/Swissair; 22—SABENA/Swissair/LAI; 23—Swissair/LAI/Alitalia; 24—SAS/KLM/LAI; and 25—KLM/SABENA/Aviaco.



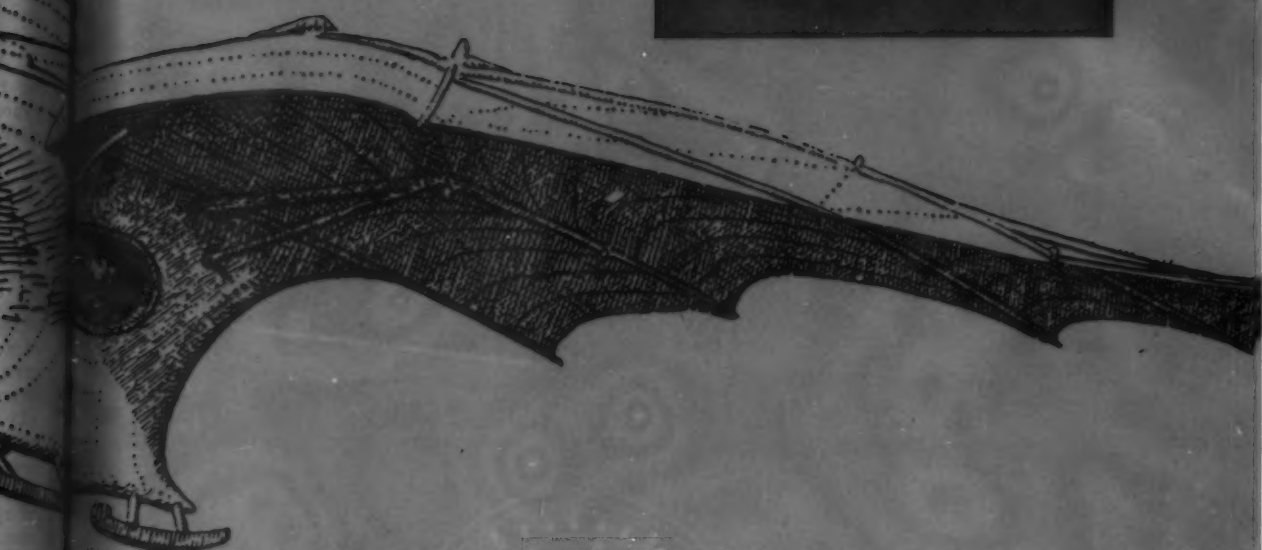
BEFORE THE WRIGHT BROTHERS! Here's the world's first motor-propelled airplane. Built by France's Clement Ader, this one actually flew for 150 feet before crashing up back in 1890. Interesting prototype, but a far cry from the iron bird on the opposite page—the Douglas A4D Skyhawk. No nuclear engine yet, but she's a real nuclear nemesis, the smallest and lightest A-bomber yet revealed.

How soon an atomic heart f

Turboprops aren't fast enough, jets haven't the range . . . the atom has to be the answer! Pratt and Whitney's building a multi-million nuclear lab—Curtiss-Wright, Convair and North American are all in or beyond the design stage—the Air Force, Navy and AEC have pulled out all stops . . . the atomic engine is top priority! The government's heckling both military and manufacturing to put a more lethal punch in the nation's sky-power . . . but the date? It's anybody's guess, says **AMERICAN AVIATION**.

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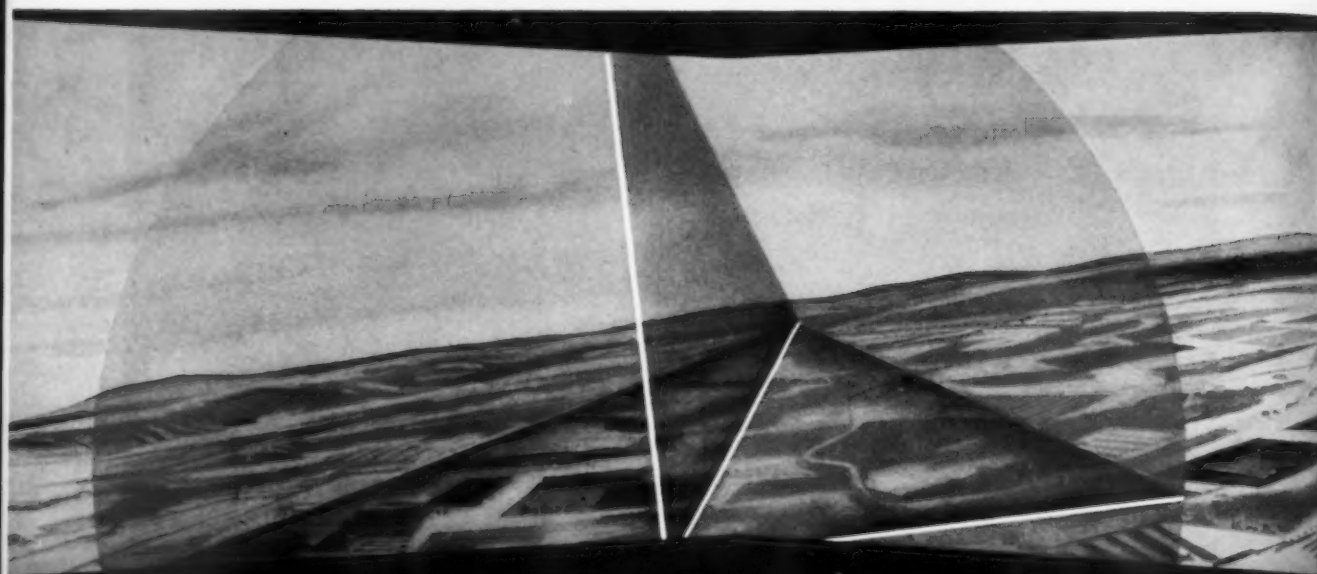
JANUARY 16, 1956

91

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Airline Commentary

By Eric Bramley

The understatement of the year is made by Frank Hansen, chief pilot of Pacific Northern Airlines, who writes that PNA had a "little weather" on its routes a couple of weeks ago. For the benefit of station managers "who think they have problems," he encloses some messages off the PNA teletype. Here's the one sent from Yakutat, Alaska:

"Office here flooded and teletype sitting in six inches of water . . . Have been two days coming 300 yards to office. Just looked out and saw my car sliding away sideways. Wind broke windows out of PNA office; boarded up temporarily with boxes. Mighty dark and have to hold flashlight in teeth to send message . . . Could use some candles." Frank adds: "We still haven't heard anything more from the guy at Yakutat—could be he blew away with his car."

A travel agent in a Pennsylvania community has found out how not to promote sales. He got a supply of airline postcards and had them mailed from California to clients back home. Message was to the effect that "this is the only way to travel," it ended "with love from . . ." and was signed with a girl's name. Complaints were immediate. Wives demanded explanations from husbands; in some cases domestic tranquility was seriously upset. Even the mayor got calls, asking if there wasn't a law against such anonymous cards. The stunt was a real flop.

Mr. Shapiro was one of New York's more talkative cab drivers. When we recently engaged his services for a ride from East Side Airlines Terminal to a hotel, he spent the entire journey extolling the virtues of cabs as the fastest and most economical means of transportation between LaGuardia and Manhattan and vice versa. Said he never lost an opportunity to do this "educational" work. We've had other New York cabbies mention the subject in lesser detail. Which leads us to comment that John Carey and his airport buses are bucking some mighty rough competition which gets its message across effectively to a captive audience.

Added note on seriousness of no-show problem: The New York City sales manager of a large airline tells us that he has 14 people who spend practically all their time firming reservations.

JANUARY 16, 1956

Broadway's Newest and Biggest Sign



Topped by a two-fifths scale model of a Super Constellation—larger than the Wright Brothers' airplane—TWA's new "spectacular" is now in operation at 43rd and Broadway, New York. Plane has running and anti-collision lights and turning propellers. Sign is 75 ft. high, 100 ft. long, and has 20,000 lamps. "Scenearama" stage is mounted on four turntables so scenes from TWA's routes can be rotated frequently. Sign was designed by Rex Werner, TWA art director.

Sales, Traffic, Promotion

TWA opens service to Denver, Oklahoma City and Tulsa on Feb. 1. Six flights daily will operate through Denver, including non-stops to Los Angeles, San Francisco and Chicago. Initial service to Oklahoma City and Tulsa will provide four flights daily (two first-class and two tourist), including a Tulsa-New York non-stop. Service to all three points will be expanded in the spring.

United Air Lines is now permitting passengers to carry baggage (21 by 13 by 8 inches) aboard four-engined equipment and stow it under seats . . . UAL has had its three newest ticket offices (Los Angeles, Chicago and Honolulu) done by Raymond Loewy, industrial designer. Basic elements of the design will be repeated at other cities . . . "Cleared for Take-Off" is title of new UAL brochure being distributed to key travel and shipping contacts. Dependability of service is stressed . . . UAL has signed lease for new cargo handling area at Philadelphia International Airport. Quarters cover 3,400 sq. ft. and include cargo customer lobby,

counter positions and offices for ground services personnel . . .

Bill Cooper, south zone sales manager in New York for American Airlines, is conducting a series of commercial account training classes to acquaint customers with the way AA does business. Major accounts are invited to enroll key traffic and transportation personnel in the three-day course. Two days are spent in classroom instruction and one day touring AA's LaGuardia Field facilities. Each student receives a "graduation certificate" . . .

Frontier Airlines is removing wash basins and plumbing from its fleet of DC-3s at a weight saving of 20 lbs. per plane. Reason: It's found a satisfactory substitute in Wash-'N-Dri, the individually-packed and moistened towlette . . .

National Airlines is hiring some Cuban stewardesses . . . Northeast Airlines is offering 17 "Pleasure Packages"—all-expense skiing vacations—this winter to New England and Canadian resorts. Auto rental is included in all packages . . .

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U.S. Local Service Airline Revenues and Expenses for Third Quarters, 1954-'55

(Compiled by American Aviation Publications from Official CAB Data)

AIRLINES	TOTAL OPERATING REVENUES (IN 000'S)			PASSENGER REVENUES (IN THOUSANDS)			FREIGHT REVENUES (IN THOUSANDS)			TOTAL OPERATING EXPENSES (IN 000'S)			AIRCRAFT OPERATING EXPENSES (IN 000'S)			GROUND & INDIRECT EXPENSES (IN 000'S)			NET OPERATING INCOME (IN THOUSANDS)		
	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change
Allegheny	1,664	1,244	33.8	1,195	882	35.5	...	...	...	1,681	1,269	32.5	816	588	38.8	865	681	27.0	-17	-25	...
Bonanza	660	497	32.8	357	272	31.3	7	5	40.0	659	473	39.3	303	208	45.7	356	265	34.3	1	24	-95.8
Central	720	573	25.7	208	161	27.5	...	...	...	747	559	33.6	325	237	37.1	422	322	31.1	-27	14	...
Frontier	1,357	1,374	-1.2	737	656	12.3	61	40	52.5	1,388	1,200	15.7	598	512	16.8	790	688	14.8	-30	175	...
Lake Central	722	588	22.8	324	192	68.8	...	...	...	704	551	27.8	331	250	32.4	373	301	23.9	18	37	-51.4
Hobawk	1,165	1,030	13.1	985	845	16.6	15	11	36.4	1,214	954	27.3	629	470	33.8	585	484	20.9	-49	76	...
North Central	1,957	1,726	13.4	1,617	1,120	44.4	...	...	...	1,868	1,553	20.3	946	797	18.7	922	756	22.0	89	173	-46.6
Osark	1,082	883	22.5	647	414	56.3	...	...	...	1,134	831	36.5	567	397	42.8	567	434	30.6	-52	52	...
Piedmont	1,684	2,079	-19.0	1,210	1,136	6.5	23	20	15.0	1,669	1,575	6.0	795	849	-6.4	874	726	20.4	15	504	-97.0
Southern	917	886	6.9	434	350	24.0	...	...	...	898	817	9.9	392	364	7.7	506	453	11.7	19	41	-53.7
Southwest	1,231	1,059	6.2	819	609	34.5	13	8	62.5	1,076	881	22.2	541	417	29.7	537	424	26.7	153	218	-29.8
Trans-Texas	1,239	1,232	0.6	549	500	9.8	16	16	...	1,178	1,114	5.6	544	515	5.6	632	599	5.5	62	117	-47.0
West Coast	1,014	835	21.4	585	474	23.4	11	7	57.1	959	831	15.4	455	388	17.3	504	443	13.6	55	4	...
TOTALS	15,412	13,978	10.3	9,667	7,591	27.3	155	113	37.2	15,175	12,568	20.8	7,242	5,992	20.9	7,933	6,576	20.6	238	1,410	-83.1

* More than 500% increase.

U.S. Airline Balance Sheet Data as of September 30, 1955

(Compiled by American Aviation Publications from Official CAB Data)

AIRLINES	TOTAL ASSETS (IN MILLIONS)			CURRENT ASSETS (IN MILLIONS)			OPERATING PROP. & EQUIPMENT (IN MILLIONS)			CURRENT LIABILITIES (IN THOUSANDS)			LONG-TERM DEBT (IN MILLIONS)			OPERATING RESERVES (IN THOUSANDS)			CAPITAL STOCK (IN MILLIONS)			SURPLUS (IN MILLIONS)		
	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change
American	203.0	176.7	16.2	110.1	73.1	50.6	80.6	97.6	-17.4	53,813	48,111	11.9	30.0	30.0	...	...	...	...	30.4	46.5	-34.6	83.9	48.4	73.3
Brantiff	31.7	35.3	-10.2	10.1	13.1	-22.9	20.2	21.9	-4.7	6,960	8,977	-22.5	...	...	...	122	384	-68.2	4.1	3.2	28.1	29.1	11.2	70.5
Capital	29.1	25.1	15.9	13.9	12.4	12.1	14.1	12.2	15.6	9,832	7,542	30.4	1.5	5.3	-71.7	105	-11	...	0.8	0.8	...	16.0	11.2	42.9
Colonial	3.9	3.6	8.3	2.3	1.9	21.1	1.4	1.5	-6.7	1,044	1,059	-1.4	...	...	...	563	303	85.0	0.5	0.5	...	1.8	1.7	5.9
Continental	12.1	10.3	19.4	5.1	4.1	24.4	6.2	5.4	6.9	4,242	2,824	50.2	2.3	2.5	-8.0	87	56	55.4	0.6	0.5	20.0	4.8	4.3	11.6
Delta	54.3	50.6	7.3	21.0	19.5	7.7	31.8	26.7	19.1	14,062	11,983	17.2	15.1	21.7	-30.4	372	64	481.3	2.2	1.8	22.2	20.8	14.4	44.4
Eastern	156.9	133.8	17.3	87.7	68.1	28.8	57.9	58.2	-0.5	52,488	34,178	53.6	27.0	36.0	-25.0	6,612	6,358	4.0	2.5	2.5	...	62.9	53.3	16.0
National	37.6	37.2	1.1	12.9	6.2	57.3	23.6	27.9	-14.7	7,068	9,232	-23.5	7.8	9.0	-13.3	494	934	-47.1	1.0	1.0	...	20.1	17.0	18.2
Northeast	7.2	6.4	12.5	3.0	2.6	15.4	2.9	3.2	-12.1	1,316	1,408	-6.6	...	...	...	175	131	31.6	1.3	1.3	...	3.6	3.2	12.5
Northwest	51.4	39.0	31.5	16.2	13.4	21.0	31.6	18.1	74.6	13,978	12,813	9.1	...	...	...	...	...	...	17.2	17.5	-2.7	11.1	8.4	32.1
Panagra	25.8	19.3	33.7	6.8	8.4	-19.1	17.7	7.1	149.3	7,878	5,478	43.8	2.9	1.2	141.7	1,950	1,796	9.1	7.5	7.5	...	4.7	3.3	42.4
PAA System	253.4	230.6	9.9	111.7	83.9	33.1	109.1	112.0	-2.6	82,921	76,786	8.0	12.0	31.5	33.3	1,994	2,415	-17.4	6.2	6.1	1.6	115.1	104.8	9.8
TWA	157.5	137.9	14.2	54.0	41.9	28.9	96.5	66.1	44.6	43,185	44,989	-4.0	35.0	31.0	66.7	...	...	...	16.7	16.7	...	55.6	49.1	13.2
United	201.1	204.2	-1.5	71.5	77.0	-7.2	125.3	128.4	0.7	56,008	54,603	2.6	37.0	51.6	-28.3	...	...	...	32.4	45.6	-29.0	72.0	51.2	40.6
Western	24.5	20.0	22.5	10.8	7.1	52.1	11.7	12.3	-4.9	7,834	6,137	27.2	3.9	3.0	30.0	...	...	...	0.7	0.7	...	11.5	9.7	18.6
TOTALS	1,249,711	1,128,010	10.8	536.9	440.1	22.0	632.8	596.4	6.2	362,645	326,115	11.2	214.0	223.9	-4.4	12,484	12,432	0.4	124.1	152.6	-18.7	503.0	391.2	28.6

% Less than 0.1%.

% More than 500% increase.

* Less than 0.1%.

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CAB NEWS

Recent CAB Decisions

Seaboard & Western Airlines and Air-World Leases, Inc. sale-lease agreement involving two S&W DC-4s and two Constellation 1049-Hs on order, approved. S&W is selling planes to Air-World and leasing them back with option to buy.

Pan American World Airways granted more flexible routing privilege for all-cargo flights permitting service to Houston and Brownsville on cargo flights operating San Francisco-Los Angeles-Guatemala route. Award is good for two years and carries restriction against local traffic between U. S. cities.

Capital Airlines granted temporary authority to suspend two daily interchange flights operated with National Airlines between Great Lakes area and Miami. Capital must explain to CAB reasons for equipment shortage; NAL exemption request to serve certain Capital points deferred.

CAB Calendar

Jan. 17—Hearing, Cincinnati-Detroit Route Transfer Investigation (TWA). Wash., D. C. Docket 7378.

Jan. 23—Hearing, Resort Airlines Certificate Renewal Case. Tentative. Docket 6545.

Feb. 20—Hearing, International Air Freight Forwarder Investigation. Wash., D. C. Docket 7132.

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Function	Type Number	Primary Element	Excitation Voltage 400 cy.	Input Current (ma.)	Input Power (Watts)	Primary Impedance Secondary Open (Phase)	Primary Resistance (line)	Secondary Element	Output Voltage	Secondary Impedance Primary Open (Phase)	Secondary Impedance Primary Shorted	Secondary Resistance (line)	Phase Shift Degrees	Sensitivity mv./deg.	Accuracy Minutes Max.
Transmitter	CGC-8-A-7	Rotor 1 Phase	26.0	100	.50	54+/-j260	37.0	Stator 3 Phase	11.8	12+/-j45	15+/-j3.5	11.8	8.0	200	7
Control Transformer	CTC-8-A-1	Stator 3 Phase	11.8	90	.23	28+/-j110	24.7	Rotor 1 Phase	23.6	220+/-j740	246+/-j60	143	8.5	400	7
Control Transformer	CTC-8-A-4	Stator 3 Phase	11.8	37	.09	67+/-j270	59.5	Rotor 1 Phase	24.0	508+/-j1680	640+/-j190	381	9.2	400	7
Resolver	CSC-8-A-1	Stator 2 Phase	11.8	84	.27	38+/-j136	27.0	Rotor 2 Phase	23.2	280+/-j600	344+/-j75	230	11	400	7
		Rotor 2 Phase	26.0	39	.43	280+/-j600	230	Stator 2 Phase	10.6	38+/-j136	70+/-j29	27.0	20	180	7
Repeater	CRC-8-A-1	Rotor 1 Phase	26.0	100	.50	54+/-j260	37.0	Stator 3 Phase	11.8	12+/-j45	15+/-j3.5	11.8	8.0	200	30*
Differential	CDC-8-A-1	Stator 3 Phase	11.8	85	.21	27+/-j120	25.0	Rotor 3 Phase	11.8	38+/-j122	47+/-j14	36.0	9.0	200	7 Rotor 7 Stator

Total Null max. 30mv for each unit
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*Torque 2600 mg.-mm./degree from CGC-8-A-7



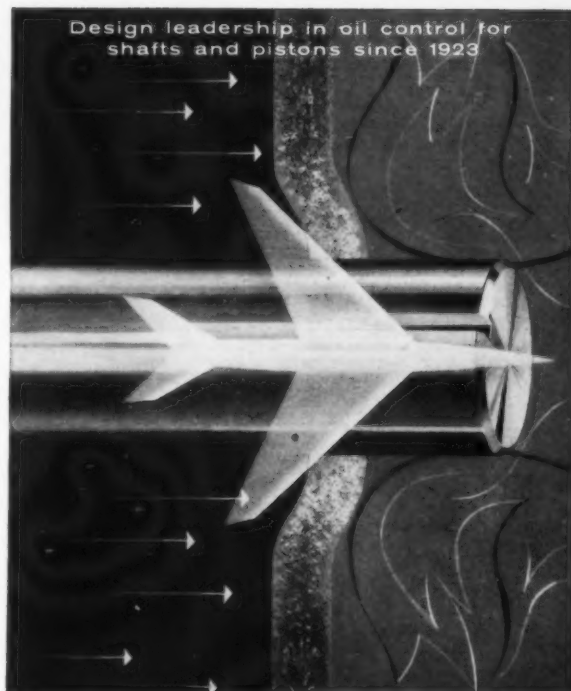
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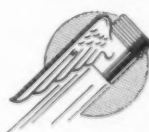
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EN ROUTE...

WAYNE W. PARRISH

It Was Snowing in Leningrad

It was five minutes after four in the afternoon when my Aeroflot IL-12 took off in a snowstorm at Helsinki and headed east toward Leningrad. What few signs of daylight remained soon disappeared. I could see nothing outside except the green light on the right wingtip. I kept my hat and coat on until the heating system began working.

Sitting in the second single seat from the rear I began to take note of the plane's interior and of my five fellow passengers. There was no stewardess and I hadn't gotten a view of the crew. There was no seat belt sign or "no smoking" sign, but I had a seat belt with a clasp very much like the well-known Air Associates hardware except that the belt was on the flimsy side.

There were lights along the top of the cabin, but no lights over the seats. Instead of an overhead rack running the length of the cabin there were individual racks consisting of nets in metal frames. There was a bell next to the plastic ash tray but I couldn't read the instructions.

The 21 seats were large, comfortable, well upholstered with a brown and red design, but seemed quite heavy as to weight. They did recline, however. Each seat had a white cloth head rest, the floor was carpeted and in addition there was a good quality green runner carpet in the aisle. The interior was furnished in a grey plastic which seemed to be of good quality and was neatly installed.

Up front near the cabin door were three instruments. One was for temperature and another for altitude but I couldn't see what the third was for. The altimeter (in meters) indicated we were above 5,000 feet.

Sliding Window Shades

Each window was rectangular and larger than a DC-3 window, mounted in a plastic frame painted to resemble wood. Instead of curtains there were white plastic panels which slid together from each side. They looked well made. Rather a novel idea for window shades. The door into the cockpit had a plastic window, too.

In the overhead racks were quite an assortment of Soviet magazines in English, German, French and other languages. There were no timetables. The cabin was well heated after the first five or ten minutes.

The engines seemed to make a lot of noise and had an unfamiliar throb to them. But they were smooth.

One hour and five minutes after takeoff, we began a smooth descent. At perhaps 1,000 feet or so we came under the overcast and I saw the lights

of the outskirts of Leningrad. The lights spread out over a great distance and I suppose this was my first impression of the U.S.S.R. I knew that Leningrad was a city of 4,000,000 but for some reason I hadn't expected so many lights. They were all white lights except for the red obstruction markers and navigation aids at the airport. Colorful neon lights, which are the feature of any U.S. city, are few and far between in the Soviet Union.

As we flew nearer the ground I could see plenty of evidence of snow. Then I spotted vehicle traffic and I guess this was the second impression—there were cars driving along the main roads and streets. We made a wide circle and then went on final approach. The pilot turned on his landing lights and I saw that it was still snowing at a fast clip.

We hit the runway throttle-on but the landing was smooth. The runway seemed to be well-lighted and must have been of considerable length because it was some time before we taxied up to an outer ramp about 500 feet from the terminal, on which was a sign in red neon lights which I assumed meant Leningrad. The engines were cut.

So here I was in the Soviet Union and with no little apprehension about what I was to do and what would happen. There was lots of snow on the ground but the ramp area was cleared. A crew member came back and opened the door. I put on my hat and coat and gathered up my overnight bags and in due course the steps were pulled up and I was first off.

A bus pulled up near the plane and I and my fellow passengers were directed onto it. The ramp people, including several women, were well bundled up. They were all middle-aged or over. Soon we were on our way to the terminal and entered by the airport side. The main lobby was furnished in marble and resembled a waiting room but it was all a little bare and cheerless and not too well-lighted. We were taken right on through the lobby to a well-lighted lounge complete with carpeting and rugs and upholstered old-style furniture and crystal chandeliers and some writing tables.

A uniformed woman of about 40 took our passports. She was accompanied by an officer who examined each document. The woman passed out customs forms which we proceeded to fill out. They were in Russian and English, and asked a lot of questions about firearms, photographic equipment, certain kinds of seeds and shrubbery and so forth, all of which I could answer with a firm "No" except when it came to

literature and I listed my Official Airline Guide and magazine. The woman spoke good English. Everybody was polite and there was no hint of a hard-boiled inquisition.

When the forms were gathered up we had a few minutes to stand around. One of the passengers was a diplomat proceeding to Moscow, apparently a frequent visitor who knew the ropes. He went directly to the restaurant for his dinner. Two passengers were Russians. Another was a Spaniard who seemed to have difficulty in understanding anything. Still another turned out to be a Norwegian businessman on his first visit to the Soviet Union to dicker about shipping some lumber.

The Norwegian came over to me and addressed me in English. When I replied he seemed surprised to learn I was an American. "You looked so unhappy on the plane I thought you were a Finn," he said.

Intourist Guide Arrives

Very shortly a young chap came to me and spoke in English. He was the Intourist representative at the airport. When he learned I was to stay in Leningrad and already had my hotel and meal coupons, he said he would take me to my hotel. Then came the baggage inspection, and it turned out nobody wanted me to open any bags. Meantime I filled out my currency form to describe all money and travelers checks in my possession. I learned later that this form is very important when leaving the country and should be filled out accurately on arrival.

Since the Intourist car had to come from town for me, I was taken into the Intourist office to wait. Here were more Soviet magazines in all languages. Every airport has an Intourist lounge. I discovered, all fitted up in old-style but comfortable furniture. I read a copy of *New Times*, a weekly in English and got inwardly burned up at several bits of ludicrous misinformation and opinion. But I was determined to hold my peace. After all I was a tourist, not a missionary, and I was scarcely in an advantageous position.

In 20 minutes the car arrived. A poorly-dressed porter put my bags in the luggage compartment. I entered the back seat and my Intourist agent sat in front with the driver. It was a Zim car, second best produced in the U.S.S.R., and resembling an old-style Buick. (The best is the Zis, an old Packard type, and No. 3 is the Pobeda resembling the old-model French Ford, the Vedette, while No. 4 is much smaller.) We drove out of the airport onto a very broad avenue and headed toward the city.

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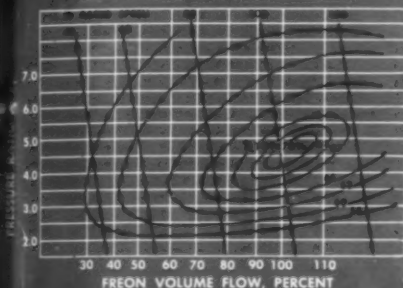
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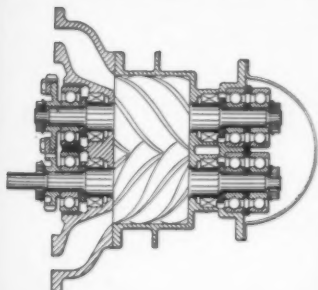


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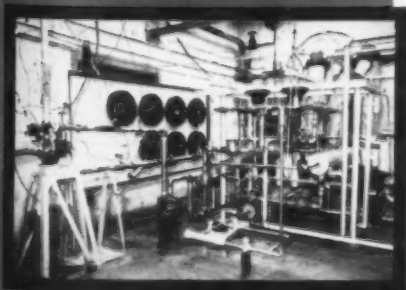
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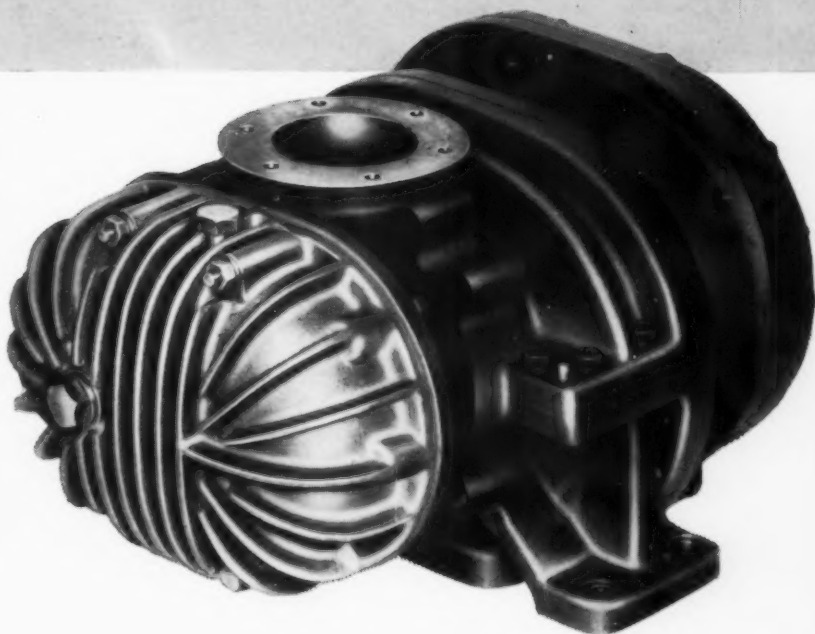
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